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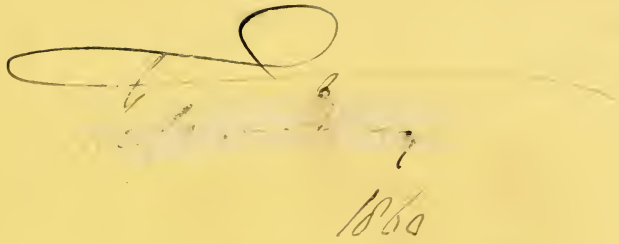

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BRITISH FERNS.

LONDON:
RICHARD CLAY, PRINTER, BREAD-STREET-HILL.

A

HISTORY

OF

BRITISH FERNS.

BY

EDWARD NEWMAN, F.L.S.

LONDON:
JOHN VAN VOORST, PATERNOSTER ROW.
1840.

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AS

A TRIBUTE TO THE MEMORY

OF

JOHN RAY,

WHOSE MATCHLESS TALENTS FIRST ELUCIDATED

THE BRITISH FERNS,

This humble Monument,

INTENDED TO ILLUSTRATE THE SPECIES,

IS ERECTED BY

AN ARDENT ADMIRER.

The cultivation of Ferns is becoming a fashionable pursuit. It is no longer confined to the botanist and horticulturist; almost every one possessing good taste has made, more or less successfully, an attempt to rear this tribe of plants. Ferns constitute so beautiful a portion of the creation, whether they ornament our ruins with their light and graceful foliage, wave their bright tresses from our weather-beaten rocks, or clothe with evergreen verdure our forests and our hedgerows, that it seems next to impossible to behold them without experiencing emotions of pleasure. Years before Ferns had become to me as friends with familiar faces, I could not pass them without turning to feast my eyes on what I thought their excessive loveliness. It cannot then excite much wonder, although I regret to say it has incurred some blame, that I should turn aside

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from a more laborious, to embrace for a brief period a more delightful study: I am not the first since Hylas who has loitered in the path of duty, and amused himself with the flowers by the way.

It was while wandering among the Welsh mountains, in the autumn of 1837, that I first felt any desire to know the names of Ferns. I had often observed the variety that half covered some of those bleak and desolate regions, where fern is cut, dried, and housed as the only litter that can be obtained for horses; but now, for the first time, I gathered hundreds of fronds, and employed the evenings in arranging them into supposed species. I found that three species were abundant in the most dreary and exposed wilds; but where some rill tumbled over a precipitous bank, or a ledge of rocks, keeping the surface in a state of perpetual moisture, half a score others were sure to be growing: in the chasm at Ponterwyd I think I counted fourteen distinct kinds.

Of every species I could obtain, not only the fronds but the roots were carefully conveyed home, and, assisted by Withering and Smith, I set to work, expecting to name them without difficulty; but how shall I express my astonishment, when, after a minute and really attentive investigation, I could only be certain of two species—Pteris aquilina and Polypodium vulgare! I soon afterwards availed myself of the assistance of my botanical friends, and obtained names for all my Ferns. Since then I have

paid some attention to the specific characters, as laid down by our best Authors, and I am inclined to doubt whether those most distinctive have been employed. It appears that the manner in which a frond is cut or divided, constitutes almost the sole ground of specific distinction. Now, we find a great number of specimens in a state of semi-cultivation, *i. e.* partaking more or less of the influence of the spade, or plough and harrow, and nourished by an almost infinite variety of soils and manures; and we also find amongst such specimens as great a variety of cutting, as we do in the colours of domesticated animals. I think no botanist, who allows his memory to turn to the varieties he has observed of Lastræa dilatata and Polystichum aculeatum, will for a moment deny this; and yet what botanist has ever presumed to treat of the cutting of the frond in Ferns as of any other than the highest importance? I entertain a different opinion. I think that mere cutting of frond is of no more value than colour in fowls or cows, and therefore should not be used as the leading character of a species; to distinguish which, I would look for less fickle characters in the figure, position, and covering of the masses of seed, in the habit of the rhizoma, and in the general outline of the frond.

During the summers of 1837–8–9, having many opportunities of obtaining roots of Ferns, I planted them with care, for the purpose of obtaining a more correct knowledge of the variations to which they were subject; and as I have heard a great deal of

the difficulty of cultivating Ferns, and have met with none myself, I will here describe the management which I have found successful.

Whenever I met with a Fern which I thought would be worth the trouble of removing, I invariably noticed the situation in which it grew—whether it was naturally exposed to sun, rain, and wind; whether it grew on a horizontal or perpendicular surface; and whether its fronds were erect, horizontal, or pendulous; whether its roots enjoyed depth of earth, or were simply

"Moored in the rifted rock."

And having thus minutely observed every natural peculiarity, my next object, when the Ferns had reached home, was, to copy Nature as closely as I could; not, indeed, to imitate rocks and mountains by a structure of flints, Bath-bricks, or clinkers, but simply by supplying to each, as far as possible, the adjuncts which it naturally enjoyed: thus, some bog-lovers, as Osmunda regalis, where placed in slight excavations, which I could readily flood with water; others, as Ceterach officinarum, which, almost deserting its native station on rocks, has established itself on our mortared walls, I supplied with crumbled mortar, carefully introduced between the stones, and placed the root, so that, in all rains, and in the constant waterings in which ferneries rejoice, it should remain as dry as possible; for to the roots of some Ferns wet is as injurious as it is needful to the well-being of others.

With regard to Osmunda, and those plants which require perpetual moisture, the only effectual way of supplying it is by planting them in a vessel (a grape-jar, for instance,) filled with bog-earth; this could be immersed in the ground, and any degree of moisture might be maintained without trouble, as the vessel would prevent it from being rapidly absorbed by the surrounding earth.

A fernery, to supersede the necessity of care and attention, should possess abundant space, a pure atmosphere, a variety of surface, natural shade, and a natural fall of water; but all these advantages can be so closely imitated, that I believe there scarcely exists in the United Kingdom a plot of a few square yards in which the zealous cultivator might not accomplish every thing he desired, and, with attention, cause the artificial to exceed in beauty the natural fernery; for the destruction by frost and wind, both highly injurious to Ferns, may, with a little management, be completely avoided.

In my own fernery I possess but one natural advantage—that of an atmosphere tolerably free from smoke; on three sides, east, south, and west, there is a straight brick wall; on the north, there is an artificial mound, tolerably covered with shrubs; to the east, beyond the wall, are some large lime-trees, which completely shut out a summer morning's sun; at noon, the south wall casts its shadow on those Ferns which are planted purposely within its reach, and these can only be illuminated for a single

half hour, when a summer sun is sinking unclouded in the north-west. Within the space enclosed by the walls are sundry buildings, by courtesy denominated rockworks, but which are in fact close imitations of the most unpicturesque stone walls that ever deformed the face of a hedgeless country. In Scotland I have seen such walls, when built against a bank to prevent its crumbling into a newly cut road, covered with a continuous garden of our most beautiful Ferns —Athyrium Filix-femina, Polypodium Phegopteris, and P. Dryopteris, Lastræa Oreopteris, and L. dilatata, Cystopteris fragilis, and Allosorus crispus, I have seen crowded together for hundreds of yards: the water from the land above is continually filtering through the walls, and thus the roots are supplied with a perpetual moisture. With a view of imitating this on a small scale, my formal walls have been built; each is slanting at a slight angle from the perpendicular, and they face different points of the compass. One, situate under a thick Portugal laurel, has never yet been visited by a ray of sunshine—

"The beams of the warm sun play round it in vain;"

they cannot reach it; a second enjoys half an hour's sun; a third basks in sunshine till noon; and thus all are varied.

Even with this choice of situation, and after having noted the natural habitat, I find it best to obtain, when possible, a number of roots of the same species, and to plant them in every situation: for instance, I

have placed Ceterach officinarum and Scolopendrium vulgare side by side in the darkest shade and the brightest sunlight; but Ceterach loves sun and drought, Scolopendrium darkness and moisture; so where Scolopendrium thrives Ceterach pines, and where Ceterach thrives Scolopendrium pines. Thus, by giving to each an abundant choice, you allow it to suit itself with a congenial situation, which is even better than condemning it to the result of your observations, which may have been erroneous.

Having introduced your Ferns on these principles of adapting the situation to each, the next grand point is to keep them well watered; and this is best effected by a garden-engine, from which, by a pressure of the thumb on the stream, it may be made to descend in an almost imperceptible shower, which is much more beneficial than a heavy watering. If there has been no rain during the day, the watering should be repeated every evening during the summer; but when the fronds have ceased to grow, when those which are deciduous have disappeared, and those which are persistent have assumed their full size and substance, then should nothing more be done to urge them forward; for all require a period of rest, a season in which the sap seems to circulate less freely, and a state of sloth or torpidity supervenes; this cannot be disturbed or hastened without injuring the strength and vigour of the plant for the ensuing year.

It will be found a great improvement to a fernery to introduce a number of mosses and Marchantiæ;

the latter are particularly useful, they speedily cover the earth and stones, and keep the surface in that state of moisture which is so very advantageous. All kinds of grasses, on the contrary, should be exterminated, for they are of so rapid a growth, and vigorous a nature, that they quickly overpower, weaken, and finally destroy the more delicate among the Ferns.

There is one species, Trichomanes speciosum, which in a state of nature has its fronds always wet; it invariably grows within the spray of waterfalls, or in similar situations, where it is constantly supplied with the needful moisture. This I find a most difficult situation to imitate, but it may be managed by suspending above the Fern a vessel containing water, which shall be allowed to drop slowly on a stone, or other hard substance in the neighbourhood of the plant, the fronds of which will be wetted by the sprinkling caused by each drop. Polypodium Phegopteris and Cystopteris fragilis benefit greatly by a similar treatment.

There is one Fern, Asplenium marinum, which hitherto I have failed to cultivate in anything like its natural luxuriance; this species grows on the most exposed rocks on our bleakest shores, and yet I believe it has never been cultivated in the open air with success: in a temperature of 70° Fah. it will grow with vast rapidity; and with a lower temperature, with artificial protection, it also answers very well.

Adopting this plan of cultivation, I have possessed the opportunity of observing the changes that took place,

and of watching, as it were, the progress of variation. I have pressed fronds from the same root for three successive years, and have found variations abundantly adequate to the establishment of species quite as distinct as many of those in the English Flora; and I consider all that cultivation, as I have explained it, can accomplish for any plant is, *to hasten or delay those changes to which that plant is by nature liable:* it cannot increase or diminish the number of actual species. In those species liable to great extremes in the cutting of their fronds, I have observed that a soil composed of decaying wood, abundantly supplied, and completely covering the roots, hastens a development of the most divided form which they can possibly assume; while a mixture of sand and stones, and a deficiency even of these, retards the development, and not unfrequently causes the plant to return to a more simple form.

Besides the British Ferns, all the species indigenous to the northern regions of America, Europe, and Asia may be grown in the open air, and without protection, excepting from severe frost, when they should be covered with straw, matting, or dried tan, thus supplying that warm clothing of snow which protects them from extreme cold in their native habitats. But if we advance one step, and restrain the free communication with the outer air, then there seems to be no limit to the species we may introduce—the beautiful productions of the tropics may be brought to our doors.

How often has it been repeated, that he who causes an ear of wheat to grow where it never grew before, is one of the greatest benefactors to mankind! If this be true, must we not also regard as a benefactor the man who has introduced the loveliest scenery of nature into the most crowded streets of our sooty and muddy metropolis! who has clothed our courtyards, aye, even our windows, with a perpetual summer! who has realized that sweet land of a poet's imagination—

"Where a leaf never dies on the still blooming bowers."

It is Mr. Ward who has effected this. His plan, although improved, I may perhaps say perfected, by various accessories, depends primarily and fundamentally on protecting the plants from too free communication with the outer air. This end is obtained by the use of glass, the light so essential to vegetation being thus freely admitted. The most ready way to try the experiment is, to procure a glass vessel, for instance, one of those jars used by druggists and confectioners; introduce some soft sandstone, or some light soil, filling one-sixth of the jar with it, and taking care that the earth be very moist, yet allowing no water to settle at the bottom of the jar; plant a fern in the earth, and then cover the jar with its glass lid, first supplying a slip of wash-leather round the rim of the jar, which will pretty nearly cut off the communication between the internal and external air; no farther attention will be required:

the fern will live, thrive, and probably seed, the seed also vegetating, and at last the jar will become too small for its contents; no watering is needed, the moisture in the earth will exhale, condense on the glass, trickle down its sides, and so return to the earth whence it arose.

There is no limit to the application of this principle: instead of a jar, it is easy to construct in the window-sill, a box, extending throughout its entire length, the bottom and sides being lined with zinc, to prevent the moisture from damaging the adjoining wood work; then let the window be a double one, like those in Russia, leaving a space of six or twelve inches between the inner and outer glass. The ferns so planted in the box, which should contain a depth of five or six inches of light sandy earth, will soon fill up the space between the two windows, supplying the most beautiful curtain or blind that could possibly be invented. The plants need not be ferns exclusively, roses, fuschias, &c. would also thrive; but it must always be borne in mind, that plants requiring a humid atmosphere should not be inclosed with those which prefer aridity: of course the upper sash alone must be made moveable. Extending the plan still farther, a large conservatory may be constructed, or even a large garden, entirely inclosed with glass; all the doors should be fitted with great nicety and exactness, and would be better if double, and always one of them shut before the second is opened.

Houses on a large scale can scarcely be made

sufficiently air-tight to prevent the escape of aqueous exhalations; a leaden pipe, pierced with small holes, should therefore be carried round the building, at as great a height as may be found practicable, and this pipe connected with a reservoir, so that an artificial shower could be produced at pleasure; if an increase of temperature were considered necessary, it might readily be attained by the introduction of hot-water pipes in the usual way.

So great is the advantage of this plan, that the plants of tropical regions can now be cultivated in London with the most perfect success; and, what is of still greater importance, may be conveyed, uninjured by extremes of heat and cold, and without any additional supply of moisture, from the most distant parts of the earth. Mr. Ward, and Messrs. Loddiges of Hackney, have, in their glass cases, transmitted our plants to the most distant countries, and have received the same cases in return filled with valuable exotics, many of which have never previously reached this country in a living state.

But the most pleasing character of this mode of cultivation is, that it can be adapted to any spot that fancy may dictate: plants in this way may be grown in a drawing-room, without ever making the least litter or apparent untidiness, and without the trouble attendant on watering. If the cases were opened annually it would be sufficiently often, and the decayed fronds, or a too luxuriant growth, might be removed, and a little water added, if there appeared a necessity for it.

Ferns, mosses, and all kinds of cryptogamous plants, seem to spring up spontaneously in these cases; and the surface of the earth speedily becomes clothed not only with a beautiful but a highly interesting vegetation. The raising of Ferns from seed, in the manner hereafter described, offers a ready way of ascertaining beyond question the value and limits of each species.

It has often been considered somewhat unaccountable that plants should thrive when deprived of air. I believe a philosopher would smile at the idea of a vacuum existing in a vessel containing abundance of earth, water, and living vegetables; but let us consider the subject, without reference to any philosophical inquiry. It must, then, be understood as an unquestionable fact, that in closing the vessel no attempt is ever made to exclude the air which it contains, or even by any experiment to diminish its quantity; therefore, admitting the property of air to press equally in all directions, we must take it for granted that there is as much air in the vessel as in an equal space outside the vessel; and so, the idea that the ferns are living without air not being based on fact, requires no refutation. The next source of wonder is, that a fern should thrive deprived of that fresh air, or that change of air, which, in a state of nature, it is constantly enjoying. The term *fresh air*, though so continually used, has no very definite meaning. If it applies to air that has not been breathed by animals, I believe we shall find that

animals alone are injured by respiring air from which oxygen has been abstracted by previous respiration: change of air, whether beneficial or otherwise, does take place, for our contrivances, although they retard, cannot preclude a change. Thus the supposed anomalies of plants living without air, or without change of air, are either dissipated or softened down: we will inquire whence arise the benefits of this plan.

In London, the air is loaded with particles of soot, than which there is scarcely any substance more injurious to vegetation; a single "smut," as it is usually called, causes a yellow mark wherever it has adhered to a leaf; and the result of an atmosphere loaded with smuts is the rapid destruction of the leaves, so that the leaves of London trees are never in a perfectly natural state; they differ in appearance, colour, and *health*, so to speak, from the leaves of country trees: the deleterious effects of London smut on the leaves influence the growth of the tree itself, and London trees are invariably of slower growth, and of less healthy appearance, than those in the country. By the plan of cultivating plants in closed vessels this injury is entirely avoided; the smut and all solids borne by the atmosphere being completely excluded, and forming a thick deposit on the glass; if the vessel employed be a bell glass inverted over the plant, then every accession of atmospheric air must take place through the earth, and consequently no portion of its impurities will be

deposited on the plant. Mr. Ward is perfectly right, when he attributes the sickly state of *London* vegetation to "the depressing influence of the fuliginous matter with which the atmosphere in which he lives is surrounded:" but it appears that other causes have been sought in the presence of gases injurious to vegetable life. This theory I shall now examine.

Mr. Ellis, in an excellent paper read to the Botanical Society in June, 1839, and since published in the Gardener's Magazine for September,* objects to the idea previously expressed by Mr. Ward, of the deleterious influence of this smut or fuliginous matter; and goes on to explain at length, that "the real mode in which such an atmosphere proves injurious to vegetation was first shown by the experiments of Drs. Turner and Christison, which were published in the ninety-third number of the Edinburgh Medical and Surgical Journal. They ascertained that it is not simply to the diffusion of fuliginous matter through the air, but to the presence of sulphurous acid gas, generated in the combustion of coal, that the mischief is to be ascribed. When added to common air, in the proportion of $\frac{1}{9000}$ or $\frac{1}{10,000}$ part, that gas sensibly affected the leaves of growing plants in ten or twelve hours, and killed them in forty-eight hours or less. The effects of hydro-chloric, or muriatic acid gas, were still more powerful, it being found that the tenth part of a cubic inch in 20,000 volumes of

* The Gardener's Magazine, conducted by J. C. Loudon, vol. xv. p. 488.

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air, manifested its action in a few hours, and entirely destroyed the plant in two days. Both these gases acted on the leaves, affecting more or less their colour, and withering and crisping their texture, so that a gentle touch caused their separation from the footstalk; and both exerted this injurious operation when present in such minute proportions as to be wholly inappreciable to the animal senses. After having suffered much injury from these acid gases, the plants, if removed in time, will recover, but with the loss of their leaves. Hence in vegetation, carried on in a smoky atmosphere, the plants are rarely killed altogether, but merely blighted for the season: accordingly, in spring vegetation recommences with its accustomed luxuriance; and as, in many situations, there is at that season, and through the summer, a considerable diminution in the number of coal fires, there will be a proportionate decrease in the production of sulphurous acid gas, and consequently less injury will be done to plants during that season. In winter, too, when coal fires mostly abound, and gas is most abundantly generated, deciduous plants are protected from its noxious operation by suspension of their vegetating powers; but the leaves of evergreens, which continue to grow through that season, are constantly exposed to its action when present in its greatest intensity. Accordingly, in many of the suburban districts around London, especially in the course of the river, where new manufactories are constantly rising up, the atmosphere is

so highly charged with noxious matters, that many deciduous plants, and almost all evergreens, cease to flourish, or exhibit only a sickly vegetation. In an interesting biographical sketch of his late lamented friend Dr. Turner, Professor Christison confirms, by subsequent experience, the opinion formerly given respecting the noxious operation of the sulphurous and muriatic acid gases on plants; he describes their action as so energetic, that, in the course of two days, the whole vegetation of various species of plants may be destroyed by quantities so minute as to be altogether inappreciable by the senses. On two occasions he was able to trace the identical effects of the same kind of works (the black ash manufactory) on the great scale which his friend and himself witnessed in their researches. In one instance, the devastation committed was enormous, vegetation being for the most part miserably stunted, or blasted altogether, to a distance of fully a third of a mile from the works, in the prevailing direction of the wind."

Mr. Ellis's is an extremely pleasing and well-written paper; it is full of very valuable information, collected with industry, and arranged with care; the experiments to which he refers are of undoubted authority, and strictly applicable to general principles in the way intended by their various authors. I think they will be received as conclusive by that large class of readers which prefers the dictum of a philosopher to the fatigue of inquiry; but never by that limited class—that troublesome and inquiring class—which

takes nothing for granted, which, in reading a well-arranged and instructive series of illustrations, argumentatively applied, is continually asking, "Quo tramite tendis?" And when, at length, the goal is discovered to which Mr. Ellis is conducting it — when he briefly concludes, "Against the evils arising from such a vitiated atmosphere, the plan of Mr. Ward provides effectual protection, as the success of his establishment amply demonstrates," then this little jury pronounces instantly a verdict of "Not Proven."

Mr. Ellis seems scarcely aware of the extreme difficulty of maintaining any essential difference between the component parts of atmospheric air on the internal or external side of any given partition. He seems scarcely aware that Mr. Ward's establishment—the success of which he justly considers beyond dispute—communicates with the surrounding murky and foul atmosphere by means of a glass door, of the usual construction—a door opened by every visitor on entering this paradise—

"Exiguus spatio, variis sed fertilis herbis:"*

And again by every visitor on returning; and that these openings are much too frequent to allow the possibility of maintaining any difference in the proportions of the gases composing the internal and external air, even supposing that the air would not so far elude Mr. Ward's care, were the door rigidly kept shut, as not to insinuate itself through the ten thousand

* This line, from the Moretum of Virgil, is over the door.

crevices, which every glass-house must possess. Before assigning the excess of sulphurous and muriatic acid gases as the deleterious property of atmosphere, obviated by Mr. Ward's plan, Mr. Ellis should have shown us that this excess was so obviated. He should have shown us that the deleterious gases did not exist within; he should have tested the interior, and given us the result; he should have told us by what mystic character engraved on the threshold these gases were scared away; in short, he should have done what he has not done—he should have analyzed facts rather than assumed them. The small inquiring class, finding that this important link in the chain of argument is deficient, will be apt to think that the lapse of that single link sets adrift the entire cargo of conclusions.

Having dismissed the gases with the alternative, that either they *do not* exist in any undue proportion in Mr. Ward's fernery and its neighbourhood, or that they *do* exist, and *are not* injurious to vegetation; having seen also that fuliginous matter *does exist* in the atmosphere to a great extent, that *it is* highly injurious to the growth of vegetables, and that *it is excluded* by Mr. Ward's plan, we shall perhaps be expected, without further inquiry, to conclude that in the exclusion of fuliginous matter rests the whole secret of its effect. To this I must demur, or the use of these closed cases would be confined to London and similar smoky atmospheres; whereas it is well known the sphere of their utility is universal. Every culti-

vator in the country could adduce his proofs of this. I will cite one only.

On a hot day in the summer of 1837, I brought home in a tin box about a dozen seedlings of Lastræa dilatata, which I had picked out of moss; each had a single frond of very small size, and extremely minute, white, and delicate roots. Having a wide-mouthed phial at hand, I put in it a small quantity of very wet earth; and then passing a pin through the single frond of one of the seedlings, and pinning it to a cork previously covered with wet wash-leather, I fixed the cork firmly in the phial, and left the fern hanging at the head of the pin with its roots downwards. Some hours afterwards I looked at my little fern, and found it exhibited no symptoms of withering; whereas the other seedlings, left carelessly on the ground beside the phial, were completely dead, and crumbled to powder between the finger and thumb. I hung up the phial by a string to a nail in the garden wall, and here it was hanging twelve months afterwards. The cork was fastened exactly as I left it, but the phial was filled with something green, which, on taking it out, proved to be a plant of the common chickweed, but to my great joy the little fern still hung from the pin; its roots were longer, it had made two fronds, and the original frond had withered, but was still strong enough to support the fern. This instance is as good as a thousand. The exposure of the roots, which is no part of Mr. Ward's plan, still adds a proof of its efficacy. The

plant could not have lived one day so exposed in the open air; in the phial, it had lived a year, had renewed its fronds, and looked healthy. How was this effect produced?

Who has regarded Nature without perceiving the word CHANGE legibly engraven on every object? Throughout creation there is a perpetual decay, and a perpetual renovation. Death is the result of life, for life contains within itself the germ of death. This fact is so obvious, that it were idle to adduce proofs. There are many active agents in this change; and it may be observed, that the office of every agent is to hurry forward the eternal round: the sun is equally the source of life and death: wind, rain, heat, cold, all are perpetual agents in this one work.

If we seek for the accessory circumstances most favourable to the rapid and healthy growth of Ferns, and refer for the information to Nature herself, we shall generally find them in protection from the sun's rays, in the uniformity and excess of atmospheric humidity, in the absence of extremes of heat and cold, in the gradual transition from one to the other, when these extremes do occur, and, finally, in that perfect stillness of the atmosphere which is rarely realized in Nature, except in caves, fissures of rocks, wells, and a few similar situations: the opposites of all these are the agents of decay and destruction; the excess of atmospheric aridity; sudden alterations in the temperature, as in the frosts of spring; excessive heat; high and boisterous winds. Were not this law of

destruction in perpetual operation, as well as the law of renovation—were they not invariably linked as it were hand in hand, the surface of the earth would become, in one extreme a desert, untenanted by living things; in the other, a self-destructive crowd.

Returning to the phial, and therefore to all closed vessels or buildings, we cannot fail to perceive, that while all the agents of life, all the vivifying principles are allowed the fullest scope for their operations, all the destructive ones are in a greater or less degree excluded: Nature is still at work: no particle of the benefit results from human skill: we add no gases to those around us in order to make the air more nourishing: we subtract none to make it more pure. Atmospheric humidity is one of the most important agents in the vitality and luxuriant growth of Ferns; and this is attained in closed cases, or under bell-glasses, in such perfection, that the most moisture-loving of all our species—Trichomanes speciosum, of which I have before spoken, as growing only in the spray of water-falls—not only lives but thrives. Mr. Ward has this plant growing with a luxuriance and vigour that can seldom be exceeded in a state of nature. In the rapid transitions from heat to cold, so common in our climate, and so particularly injurious to tender vegetables, these cases offer a complete barrier: for experiments prove beyond question that the atmosphere within the glass retains its degree of temperature very long after a change has taken place in the

air that surrounds it, and excess of cold, accompanied by perfect stillness, is incomparably less injurious than when coupled with rapid motion. Thus our travellers in Polar regions speak of intense cold, as indicated by the thermometer, having been scarcely inconvenient to them if the atmosphere were perfectly still; but if the wind rose, although the quicksilver simultaneously fell, as was almost invariably the case, the cold was most distressing. In England, if Fahrenheit's thermometer be at 30°, we walk about or stand exposed to it without any sensation of pain, but if we face it in travelling by railway at the rate of thirty miles an hour, the cold becomes perfectly intolerable. In fact, it has been abundantly proved by experiment, that a much greater extreme of heat or cold may be borne by plants, by animals, and even by the human frame, if both the atmosphere and the objects of experiments be in a state of perfect quiescence. In closed cases we thus not only avoid rapid changes of temperature, but the active motion in extremes of temperature, which is the most injurious property of such extremes. The deleterious effect of boisterous winds on the fragile fronds of Ferns needs no exemplification; it is so great, that if a specimen of Cystopteris be moved from its protected habitat, and placed where it may receive the full force of the wind, that alone will, in a few weeks, work its utter destruction: to such a plant how grateful must be the motionless atmosphere thus provided!

The solution of the problem appears to me to be

simply this: that while the power of destructive natural agents is restrained, that of beneficial natural agents is retained, and its efficacy ensured.

Carrying out the system, nothing is more easy than to raise any species of Fern from the seed, which every herbarium affords abundant opportunity of procuring; and thus Ferns from every country may be assembled in our houses, with even less trouble than by transporting the roots in cases. The seeds should be first detached from the frond by gently rubbing the masses of thecæ, and shaken on a common dinner-plate; then, having procured some light sandy earth, crumble it on the plate, and shake it about for a minute or two, when all the seeds will be found adhering to the little masses of earth; spread this earth, as lightly as may be, over other light sandy or loamy earth, either in a garden or in a flower pot, in doors or out, always taking care very carefully to cover the seed with a bell-glass, or other glass cover, excluding, as completely as possible, communication with the outer air. In a few weeks the young ferns will come up abundantly, in a sinuous horizontal frond, closely resembling that of Marchantia; but in a very short time other fronds will succeed, having the true characters of Ferns.

Fully believing that our beautiful Ferns will become ere long the denizens of our drawing-rooms, and knowing that in many instances they are already so—believing also that many who are lovers of

Nature, but, at the same time, not technical botanists, will be glad of the ready means which I trust this work will afford them of obtaining the names of the species they procure, I have ventured on making my public appearance in a science in which I am *now* but a tyro, and to which a few years back I was a stranger. I do not on this account ask for a partial reception, for I am well aware that those only who are competent should undertake the task of instructing others.

In my descriptions I have aimed at simplicity and perspicuity; I am aware that some may object to the frequent occurrence of Latin words, but these words will, I think, be found very few in number, and I trust their meaning will be rendered perfectly intelligible by the following explanation. I have treated every fern as having three parts—the *roots*, the *rhizoma*, and the *fronds*. At page 13, the small fibres represent the roots. The three pieces placed transversely with the page are portions of the rhizoma, which is, in that instance, called a *creeping* rhizoma, because it creeps to a great distance under the ground; when it does not creep in this way it is called a *tufted* rhizoma. The nine upright stems, which are represented rising from the rhizoma, are the fronds; some botanists consider these the branches, others call them the leaves of Ferns; the fronds of Ferns, like leaves of trees, wither and fall off every year. The frond consists of a stem, which extends from the *rhizoma* to its extreme point or

apex; this will be seen in the large or expanded frond at page 13, in the erect frond at page 12, and in the frond at page 48; this main stem is called the *rachis*. The branches on each side of this rachis are called *pinnæ;* at page 12, the frond is *pinnatifid*, the pinnæ not being quite separated from each other; the little fronds at page 30 are called *pinnate*, because the pinnæ are quite separated; in the frond at page 48 the pinnæ are not only quite separated, but they are also deeply divided. The pinnæ of the frond at page 13 are divided into a number of branches on each side; the branches are *pinnulæ*. The pinnulæ are again divided into lobes.

The seeds of ferns are not preceded by any visible flowers; they are generally produced on the back of the frond in capsules, called *thecæ;* these thecæ are clustered together in little masses, and are situated on the veins in the divisions of the frond; see the figure at the top of page 45, where it will be observed that each mass has a small white kidney-shaped spot; this is intended to represent a white membranous substance, something like a portion of the cuticle of the frond, and is called the *indusium*.

While this Work has been in progress, I have received the most kind and valuable assistance from some of our most distinguished Botanists; and I beg to assure the gentlemen whose names appear below, how all-important to one unskilled in the science their services have been, and to return them my

sincere thanks :—Professor Don, who has afforded me every possible information on the subject of nomenclature, and in no single instance have I intentionally changed a name in opposition to his views. This assertion seemed requisite in justice to myself, lest, having, in some way or other, altered more than half the names employed by Sir J. E. Smith, (and therefore in general use,) I might perchance be charged with the most paltry of all ambitions—the desire to subvert an established name : Mr. Smith, of the Royal Botanic Gardens at Kew, who has also assisted me in the nomenclature of genera, and of whom I have elsewhere spoken; Mr. Foster, the highly respected Vice-President of the Linnean Society; Mr. Ward, of whose excellent plan of cultivating Ferns I have already said so much, and whose extensive collections, both of living and dried specimens, have always been open to me; Mr. C. C. Babington, of Cambridge, whose collection and valuable notes have been unreservedly placed in my hands; Mr. White, of Cloudesley-square, who has taken infinite pains to determine for me the venation in Pteris, Lomaria, Ceterach, and indeed in every genus that presented any difficulty; Mr. Bowerbank, whose splendid microscope has been constantly at my service; Dr. Greville, of Edinburgh; Mr. Moore, of the Dublin Society's Botanic Garden; Mr. R. Ball, of Dublin; Mr. J. Ball, of Cambridge; Mr. Heysham, of Carlisle; Mr. E. J. Quekett, of Wellclose-square, London; Mr. T. B. Flower, of Surry-street, Strand, London; Miss

M. Waring, of Bristol; the Rev. W. T. Bree, of Allesley Rectory, near Coventry; Mr. D. Cooper, Hon. Curator to the London Botanical Society; Mr. Peete, of Keston Heath; Mr. H. Doubleday, of Epping; Mr. Adam White, of the British Museum; Mr. Samuel Woodward, jun. Geological Society, London; Mr. Luxford, of Ratcliff-highway; Mr. Pamplin, of Queen-street, Soho; Mr. Bain, assistant to Mr. Mackay at the College Botanic Garden, Dublin; Mr. J. Janson, of Stamford Hill; Mr. Kippist, Linnean Society, Soho-square; Mr. Ferguson, of the Botanic Garden at Belfast; Mr. Cameron, of the Botanic Garden, Birmingham; Mr. Holman, of Reigate; Mr. Borrer, of Henfield; and Mr. Beevis, gardener to Mr. Allcard, of Stratford-green.

ALPHABETICAL TABLE OF ENGLISH NAMES.

Adder's-Tongue, 103
Alpine Prickly Fern, 43

Beech Fern, 24
Black Spleenwort, 68
Brachen, 13
Brakes, 13
Bristle Fern, 88
Brittle Fern, 31
Broad Fern, 58

Common Prickly Fern, 37
Common Spleenwort, 80
Crested Fern, 53

Flowering Fern, 96
Forked Spleenwort, 73

Green Spleenwort, 78

Hard Fern, 11
Hart's-Tongue, 82

Lady Fern, 62

Maidenhair, 9
Male Fern, 50
Marsh Fern, 45
Moonwort, 100
Mountain Fern, 47

Oak Fern, 26

Polypody, 29

Rigid Fern, 55
Rock Brakes, 17
Rue-Leaved Spleenwort, 70

Scaly Hart's-Tongue, 85
Sea Spleenwort, 75
Spear-shaped Spleenwort, 66

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Wilson's Filmy Fern, 94
Wood Fern, 26
Woodsia, 29

ALPHABETICAL TABLE OF GENERA.

Acrostichum, 6, 45
ADIANTUM, 5, 9
ALLOSORUS, 5, 17
Aspidium, 6, 37
ASPLENIUM, 7, 66
ATHYRIUM, 6, 62

Blechnum, 5, 11
BOTRYCHIUM, 7, 100

CETERACH, 7, 85
CISTOPTERIS, 6, 31
Cryptogramma, 6, 31
Cyclopteris, 6, 31
Cystea, 6, 31
CYSTOPTERIS, 6, 31

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HYMENOPHYLLUM, 7, 92

LASTRÆA, 6, 45
LOMARIA, 5, 11

Nephrodium, 6, 55

Onoclea, 17
OPHIOGLOSSUM, 7, 102
OSMUNDA, 7, 96

Phorobolus, 17
POLYPODIUM, 5, 20
POLYSTICHUM, 6, 37
PTERIS, 5, 13

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Stegania, 5, 17

TRICHOMANES, 7, 88

WOODSIA, 6, 29

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ALPHABETICAL LIST OF SPECIES.

ACULEATUM, 37, 39, 40
ADIANTUM NIGRUM, 68
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Alpinum, 30
Alternifolium, var. 71 β
Angulare, var. 37
Angustata, var. 34
AQUILINA, 13
Arvonicum, 30
Boreale, 12
Brevisetum, 88
Calcareum, var. 27
Cambricum, var. 22
CAPILLUS-VENERIS, 9
Ceterach, 85
Concavum, 61
Crispa, 18
CRISPUS, 18
CRISTATA, 54
Cristatum, 54
Dentata, var. 32
Dentatum, 32
DILATATA, 58, 59, 60, 61
Dilatatum, 59
DRYOPTERIS, 26, 27
Dumetorum, var. 60
Femina, 13
FILIX-FEMINA, 63, 64
FILIX-MAS, 51
Fontanum, (POLY.) 30
Fontanum, (ASPL.) 4
Fontanum, (ADIAN.) 9
Fragile, 33
FRAGILIS, 32, 33, 34, 35
Fragrans, 48
Germanicum, 71 β
Hyperborea, var. 30
Hyperboreum, 30
Ilvense, 30
ILVENSIS, 30
Irrigium, var. of var. 64
Lætum, 63
LANCEOLATUM, 66
Latebrosum, 24
Lobatum, var. 39
Lonchitidoides, var. of var. 39
LONCHITIS, 44
Lonchitis, var. 40.
Lucidum, 68
LUNARIA, 100
MARINUM, 75
Murale, 71
Nemorale, 51
Odoriferum, 48
OFFICINARUM, (CETER.) 85
Officinarum, (SCOLO.) 82
Onocleoides, 18
OREOPTERIS, 48
Palustre, 46
Palustris, 46
PHEGOPTERIS, 24
Pulchellum, 26
Pyxidiferum, 88
Ramosum, 78
Recurvum, 61
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THELYPTERIS, 46
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TUNBRIDGENSE, 92
VIRIDE, 78
VULGARE, (POLY.) 20, 22
VULGARE, (SCOLO.) 82
VULGATUM, 103
WILSONI, 94

☞ The reference is to the figure: where more than one is given, the number of references indicates the number of former species here treated as varieties; thus, *three* are included in ACULEATUM, *four* in DILATATA, &c. Names printed thus, "ACULEATUM," are retained as species; thus, "*Alternifolium*, var." are former species treated as varieties; and thus, "*Alatum*," are synonymes.

ILLUSTRATIONS NOT EXPLAINED IN THE TEXT.

PAGE 57. Pale's Meeting House, Radnorshire.
69. Llanthony Abbey.
72. Leominster Buttercross.
74. Conway Castle.
77. Freshwater Bay, Isle of Wight.
79. Cwm Idwel, Caernarvonshire.
84. The Bull Inn, Birch Wood Corner.
91. The Round Tower of Antrim.
93. Wyckham Hatch, Kent.

Sadler, in his enumeration of true Ferns, assigns 1508 species to the whole world, sixty-seven to Europe, and thirty-six to Britain; we have, therefore, but $\frac{1}{42}$ part of the entire number. Supposing that the 1508 species were arranged in the most unexceptionable manner, all their characters carefully investigated, and their position in some system fixed in strict accordance with those characters, there still must exist many a gap between species and species, or how could those numerous ferns still undiscovered be hereafter admitted into the arrangement? Granting, then, the imperfection of any arrangement, however numerous the species it may embrace, how can we hope to arrive at anything approaching a continuous series, when our materials can scarcely be supposed to reach $\frac{1}{100}$ part of the entire number? How idle would it be to expect that in our mere handful of Ferns, each should approach another by that gentle gradation which would indicate the existence of a connected and harmonious whole? Fully impressed with the difficulty of the case, I am by no means disposed to complain of errors in the arrangements of those authors who have preceded me, neither have I any argument to adduce in favour of my own.

It is curious to remark how each character by which Ferns have been distinguished has yielded to a new and more precise one. Sir J. E. Smith observes that Ray, Tournefort, Plumier,

and other early systematic botanists resorted, in the first instance, to the shape of the *frond*, than which nothing is more vague, unnatural, or uncertain, as a generic distinction. Linneus and his followers have trusted to the shape of the *masses* of *capsules*, whether round, oblong, linear, or indeterminate, whence far better characters are obtained, but not such as prove sufficient. The writer of this, furnished with a vast collection of Ferns in the Linnean Herbarium, and from that of Sir Joseph Banks, first suggested an additional principle of arrangement, derived from the form and insertion of the membranous *cover* or *involucrum*, and especially from the direction in which that part bursts or separates from the frond when arrived at maturity; whether, if lateral, at the side towards the margin of the frond, or of its segments, or towards the rib or vein; or if terminal, towards the extremity or contrariwise. This principle is found to produce very certain distinctions, and to establish the most natural genera. All subsequent writers on Ferns have adopted it.—*English Flora*, iv. 279. In a few short years we find this favourite character almost lost sight of, and a fourth, that of the venation, rapidly superseding it.

Most authors have admitted the importance, for purposes of nomenclature, of those characters which are spoken of by Smith as derived from the fructification; but, until lately, other characters of equal value, drawn from the situation of the veins, have been entirely neglected; this is now no longer the case, and I am inclined to believe, that henceforward, in the veins of a new fern will be sought the characters which shall decide its genus. At present, I can say but little for the correctness of our writers on this subject. Presl has published an expensive and highly-illustrated work, professing to exhibit the venation of every genus; but he has not paid the subject that close attention which it requires: of the British species few are perfectly accurate; some, as Allosorus crispus, are either drawn from supposed memory, or from imagination; and many important and obvious characters, as the anastomozing veins of Ceterach officinarum, he has entirely overlooked. If the exotic species are drawn in an equally careless manner, the work is of little value.

Mr. Smith, of the Royal Botanic Garden at Kew, has paid great attention to the venation of Ferns; he has prepared an essay on this subject, which I trust we shall shortly see in print, and I am sure, from my knowledge of the way in which he has

treated the subject, that when the result of his labours is published, it will abundantly repay the botanist for a careful and minute examination. Mr. Smith having, in the most unreserved manner, communicated to me his own ideas on the subject of arrangement and nomenclature, I was delighted to find, that, with very few exceptions, our views were similar: in one or two instances I was obviously wrong, and in these instances I was too glad to have the opportunity of rectifying my errors by the aid of his superior knowledge of exotic genera. In a few instances we still differ, and in announcing this, I fear I shall be considered as pronouncing my own condemnation: still I venture to pursue my way, and "by an earlier appearance in the literary horizon, give myself the chance of what the astronomers call an *Heliacal rising*, before the luminary in whose light I am to be lost shall appear."

In making out my list of genera I have followed no other rule than that of priority; and if, in any instance, I have departed from this rule, the departure has been entirely unintentional, and I shall be glad to be informed, in order that I may take an early opportunity of correcting my error. The characters which I have assigned the genera are very concise, perhaps it may be thought too much so, but it has been my wish not to swell the technical portion of a work which is avowedly intended less for the scientific botanist than for the general reader; moreover, a repetition of the generic characters will occur in the description of each species.

With respect to numerous species here treated as varieties, I have not intentionally omitted one of the characters by which they may be distinguished, nor have I degraded them from their former station in order to save the trouble and expense of figuring them. I have taken as much pains to be explicit in these varieties as I should have done were they still treated as species, and each is as correctly figured: the reader must judge whether they are to be considered species or varieties. It will give me infinite pleasure to know that permanent and distinctive characters have been found for Polypodium calcareum, Woodsia hyperborea, Cystopteris dentata, Polystichum Lonchitis, Lastræa dumetorum, Athyrium rhæticum, and Asplenium alternifolium: these would make a noble addition to a list which is at present a very meagre one; but until such characters are found I consider it far better to leave them as I have left them, in the

subordinate rank of varieties, more especially as the raising of Ferns from seed must, before long, set at rest for ever this wearisome inquiry.

Of the Asplenium fontanum of our English authors, a beautiful little plant, and a great favourite in cultivation, I have given a figure below. Sir J. E. Smith says that it occurs "on shady old walls, or rocks, very rare. At Amersham, or Agmondesham church, Bucks, found by a Mr. Bradney, according to Hudson, and from whence it was brought alive to Kew garden, by the late Mr. Aiton, from whom I have a specimen; but the church has been whitewashed and the plant destroyed. Mr. Hudson gathered the same in a stony situation near Wybourn, in Westmoreland, or rather, perhaps, Wiborn, in Cumberland."—*English Flora*, vol. iv. p. 312. Mr. Francis adds to the above information: "I have been informed that living plants were found at a waterfall in either Northumberland or Westmoreland, ten or twelve years ago, and also that it once grew on Alnwick castle; but if so, it is no longer found there."—*Analysis of the British Ferns, &c.* p. 41. All these records appear to be involved in doubt, with the exception of that relating to Amersham church, where, if really found by Mr. Aiton, I presume it must have been previously planted.

A SYNOPTICAL TABLE

OF THE

GENERA OF FERNS, AS FOUND IN THE WORKS OF BRITISH AUTHORS.

FILICES ANNULATÆ.

The thecæ are provided with an elastic marginal ring, by the operation of which the cups containing the seeds are torn asunder, and the seeds dispersed.

SECTION I.—FILICES ANNULATÆ VERÆ.—Thecæ attached in masses to the *back* of the frond.

FAMILY I.—*Adiantaceæ.*—Thecæ covered by a marginal or submarginal, prolonged or elongate portion of the frond, or its superior cuticle: in some instances having the appearance of an indusium, in others being evidently a portion of the frond.

ADIANTUM (Smith).—The margin of the frond itself reflexed, and the reflexed portion bearing nearly circular masses of thecæ. British Species, 1. CAPILLUS VENERIS; Exotic species, very numerous.

Blechnum (Smith).—Thecæ attached in a continuous line parallel to each side of the midvein; the line of thecæ is covered by a continuous indusium, from the back of which lateral veins issue, and extend in parallel lines to the margin. Exotic species, 1. *Lanceola*; 2. *Trifoliatum*; 3. *Unilaterale*, and about forty others.

LOMARIA (Loudon).—Thecæ and indusium continuous and linear, as in Blechnum, but either marginal or submarginal, no lateral veins extending beyond the indusium to the margin. British species, 1. SPICANT.

Stegania (Gray).—Apparently identical with Lomaria. Exotic species, 1. *Patersoni*; 2. *Lanceolata*; 3. *Fluviatilis*, and several others.

PTERIS (Smith).—Thecæ in a continuous marginal line, covered by a continuous marginal indusium. British species, 1. AQUILINA. Exotic species, ninety-four.

FAMILY II.—*Polypodiaceæ.*—Thecæ in a circular mass, *uncovered* by any indusium.

ALLOSORUS (Loudon).—Margin of the frond convolute, concealing the masses of thecæ. British species, 1. CRISPUS. Exotic species, few in number.

Cryptogramma (Hooker).—Apparently identical with Allosorus. Exotic species few in number.

Polypodium (Smith).—Margin of the frond flattened, not concealing the masses of thecæ. British species, 1. Vulgare; 2. Phegopteris; 3. Dryopteris. Exotic species, very numerous.

Woodsia (Smith).—Thecæ intermixed with bristles supposed to be analogous to an indusium. British species, 1. Ilvensis. Exotic species few in number.

Acrostichum (Bolton).—Veins forming a complex network, whereas, in the preceding genera, they are never united or connected after leaving the midvein. Exotic species, 1. *Reticulatum*; 2. *Obliquum*; 3. *Crassifolium*, and four others. (Family doubtful.)

Family III.—*Aspidiaceæ*.—Thecæ in a circular mass, *covered* by an indusium.

Cystopteris.—Indusium annexed to the frond at the insertion of the thecæ, which it contains as in a cup; the unattached margin of the cup is striated and ragged. British species, 1. Fragilis. Exotic species numerous.

Cistopteris (Hooker)
Cystea (Smith)
Cyclopteris (Gray)
} Are identical with Cystopteris.

Aspidium (Smith).—Indusium attached by the centre only; lateral veins anastomozing, and sometimes forming a complete network. Exotic species, 1. *Trifoliatum*; 2. *Macrophyllum*; 3. *Heracleifolium*, and eleven others.

Polystichum.—Indusium attached by the centre only; lateral veins never united after leaving the midvein. British species, 1. Aculeatum; 2. Lonchitis.

Nephrodium (Don).—Indusium reniform; some, or all of the lateral veins of each pinnula united to corresponding veins in the adjoining pinnula. Exotic species, 1. *Molle*; 2. *Unitum*; 3. *Arbuscula*; and about seventeen others.

Lastræa.—Indusium reniform; veins never uniting after leaving the midvein. British species, 1. Thelypteris; 2. Oreopteris, (I expect that these two species will be separated as proposed by Schott, under the names Thelypteris Palustris, and T. Oreopteris; they differ from the following in bearing the masses of thecæ on both branches of the lateral veins when they are forked, whereas the remaining species bear thecæ on the anterior branch only;) 3. Filix-mas; 4. Cristata; 5. Rigida; 6. Dilatata. Exotic species very numerous.

Family IV.—*Aspleniaceæ*.—Thecæ in an *elongate* mass, *covered* by an indusium.

Athyrium (Gray).—Thecæ in elongate-reniform, or sausage-shaped masses. British species, 1. Filix-femina. Exotic species few in number, mostly included in the genus Allantodia, which is apparently identical with Athyrium.

Asplenium (Smith).—Thecæ in elongate and straight masses. British species, 1. Lanceolatum; 2. Adiantum-nigrum; 3. Ruta-muraria; 4. Septentrionale; 5. Marinum; 6. Viride; 7. Trichomanes. Exotic species very numerous.

Scolopendrium (Smith).—Thecæ in elongate and straight lines, always in pairs, the two indusia meeting between them, and at first appearing but as one indusium. British species, 1. Vulgare. Exotic species very few.

Family V.—*Grammitideæ.*—Thecæ in an *elongate* mass, *uncovered* by any indusium.

Grammitis (Hooker).—Lateral veins unconnected at their extremities. Exotic species, 1. *Serrulata ;* 2. *Myosuroides;* 3. *Setosa,* and many others.

Ceterach (Loudon).—Lateral veins anastomozing. British species, 1. Officinarum. Exotic species, only one or two known.

Section II.—Filices annulatæ desciscentes.—Thecæ attached in a receptacle situated on the *margin* of the frond.

Family VI.—*Hymenophyllaceæ* (including the entire section).

Trichomanes (Smith).—Marginal receptacle *furnished* with an exserted bristle-like appendage. British species, 1. Speciosum. Exotic species very numerous, and of great beauty.

Hymenophyllum (Smith).—Marginal receptacle *unfurnished* with the bristle-like appendage. British species, 1. Tunbridgense; 2. Wilsoni; Exotic species unknown to me.

FILICES EXANNULATÆ.

The thecæ are unprovided with the elastic marginal ring.

Family VII.—*Osmundaceæ.*—Vernation circinate and rachis solid, as in the Filices annulatæ.

Osmunda (Smith).—Thecæ in a branched spike terminating the frond. British species, 1. Regalis. Exotic species very numerous.

Family VIII.—*Ophioglossaceæ.*—Vernation straight, and stem hollow.

Botrychium (Smith).—Thecæ in a branched spike attached to a divided frond. British species, 1. Lunaria. Exotic species numerous.

Ophioglossum (Smith).—Thecæ in a straight club-shaped spike attached to an undivided frond. British species, 1. Vulgatum. Exotic species few.

*** The generic and specific names printed in small capitals are employed in the following pages; those in italics are considered either synonymous or exotic, and are not employed. The name following the genus is that of a *British* author who

has employed it. The genera, for which no authority is given, have not been employed by any previous writer on the British Ferns. The works in which the genera will be found are these:—

Bolton.—Filices Britanniæ, by James Bolton, 1 Vol.

Don.—Transactions of the Linnean Society of London, 18 Vols. Remarks on some British Ferns. By David Don. Vol. xvii. p. 435.

Gray.—A Natural Arrangement of British Plants. By Samuel Frederick Gray. 2 Vols.

Hooker.—The British Flora, by William Jackson Hooker. 1 Vol.

Loudon.—Hortus Britannicus, by J. C. Loudon. 1 Vol.

Smith.—The English Flora, by Sir James Edward Smith. 4 Vols.

SPECIES OF BRITISH FERNS.

In accordance with the foregoing Table, the species which follow are arranged. In a few instances, where the species of other authors are treated as varieties, the descriptions have been copied verbatim, lest I should be charged with ignorance of the identical plant intended. With these exceptions the definitions are exclusively from nature. The illustrations, without any exception, are from nature, and are drawn by myself on the wood: the manifest discrepancy between previous figures and my own will abundantly prove that mine are original: nothing can be more striking—and I allude to the subject with regret, since it is one likely to cause confusion—than the difference between my figures, and some recently published by another writer: the illustrations in each work, professing to represent the same Fern, are in many instances more dissimilar than any two species of Ferns which Great Britain produces: the figures of fine varieties of Polypodium vulgare, described by Linneus and Mackay, offer an abundant proof of this assertion.

The list of localities will, I fear, be considered rather meagre, but I have found it needful to exercise the greatest caution in this respect. In the numerous specimens kindly sent me for examination, I have sometimes found the seedling form of Lastræa Filix-mas named Woodsia Ilvensis, and Lastræa Oreopteris in numberless instances named Thelypteris: these and similar errors have thrown a doubt over many lists, which I could not verify by examination.

MAIDENHAIR.

ADIANTUM CAPILLUS-VENERIS of Authors.
Adiantum fontanum.—Gray.

LOCALITIES.

ENGLAND . . . In Cornwall, on dripping rocks near St. Ives; in a small cave on the east side of Carrack Gladden, a cove between St. Ives and Hayle; and at the Lizard. In Devonshire, near Ilfracombe.

WALES . . . . In Glamorganshire, on rocks near Dunraven; at Port King; and on Barry Island; it occurs in many places along the coast between these localities.

SCOTLAND . . Unknown.

IRELAND . . . South Isles of Arran; Cahir Couree Mountains, near Tralee; at the foot of a rock facing south-west on the banks of Lough Bulard, near Urrisbeg, Cunnemara.

ADIANTUM Capillus-Veneris, the true Maidenhair, the only species of the genus that has been found in Britain, is one of the rarest and most beautiful of our ferns. It is always found in moist caves, or on rocks near the sea-coast, where it roots firmly in the crevices of the stones, preferring a perpendicular surface, whence its delicate fronds grow in a nearly horizontal direction, inclining upwards at the extremity: its pinnulæ vary in size, from that of those on the specimen sketched in the above figure to that of the detached pinnula on the left.

The roots are wiry, black, and fibrous, the rhizoma black and scaly, and creeping though very slowly: the young fronds make their appearance in May, are fully developed in July, and remain green till the winter: the future divisions of the frond are not apparent on its first expanding; three or five pinnæ only appear, and these in a few days become divided into pinnulæ.

Although the form of the frond has been repeatedly described by botanists in precise terms, it must be considered irregular:

the rachis is throughout naked, shining, and nearly black; the branches, or pinnæ, are alternate, and on these are the pinnulæ, also alternate, and each on a distinct foot-stalk: botanists describe these pinnulæ as wedge-shaped, or fan-shaped, but their form is not uniform, and often varies greatly in the same frond. The fronds are fertile and barren. When fertile, the exterior margin of each pinnula is divided into a number of lobes, the terminal portion of which is bleached, scale-like, and reflexed, and bears the thecæ in somewhat circular masses on its internal surface: this reflexed margin, and also the situation of the veins, is shown in the detached pinnula to the left of the cut in the preceding page: the veins divide frequently, and without regularity, and run into the bleached reflexed portion of the lobe, ceasing before its extreme margin, and each bearing a mass of thecæ at its extremity; this will be seen on reference to the lower figure of the cut in the preceding page, which represents only one lobe or division of the pinnula: the reflexed portion turned back, and showing the masses of thecæ, is unshaded. When barren, which occurs but seldom, the margins of the pinnulæ, instead of being bleached and reflexed, are sharply serrated (as represented in the annexed figure), and perfectly green to the extremity: with this exception, the fertile and barren fronds are similar. When the frond has passed maturity, and approaches decay, the pinnulæ of this fern fall off like the leaves of phænogamous plants, the rachis remaining bare and leafless, and assuming the appearance of a bunch of strong bristles.

Mr. Ball, of Dublin, informs me that this fern is so abundant in the South Isles of Arran, that the inhabitants gather it, and use a decoction of the fronds instead of tea: the same gentleman pointed out to me a remarkable property it possesses, when cultivated on Mr. Ward's plan, of checking communication with the outer air by means of a glass cover;—the lobes of the pinnulæ become viviparous at the extremities, the seeds actually vegetating while still *in situ*, and the young plants taking root like parasites in the substance of the old one: from a specimen, in which this peculiarity was clearly exhibited, I sketched the figure in the margin.

HARD FERN.

Lomaria Spicant.—Desveux, Presl, Sadler.

Osmunda Spicant.—Linneus, Bolton, Berkenhout, Lightfoot, Hudson.

Blechnum Spicant.—Roth, Withering.

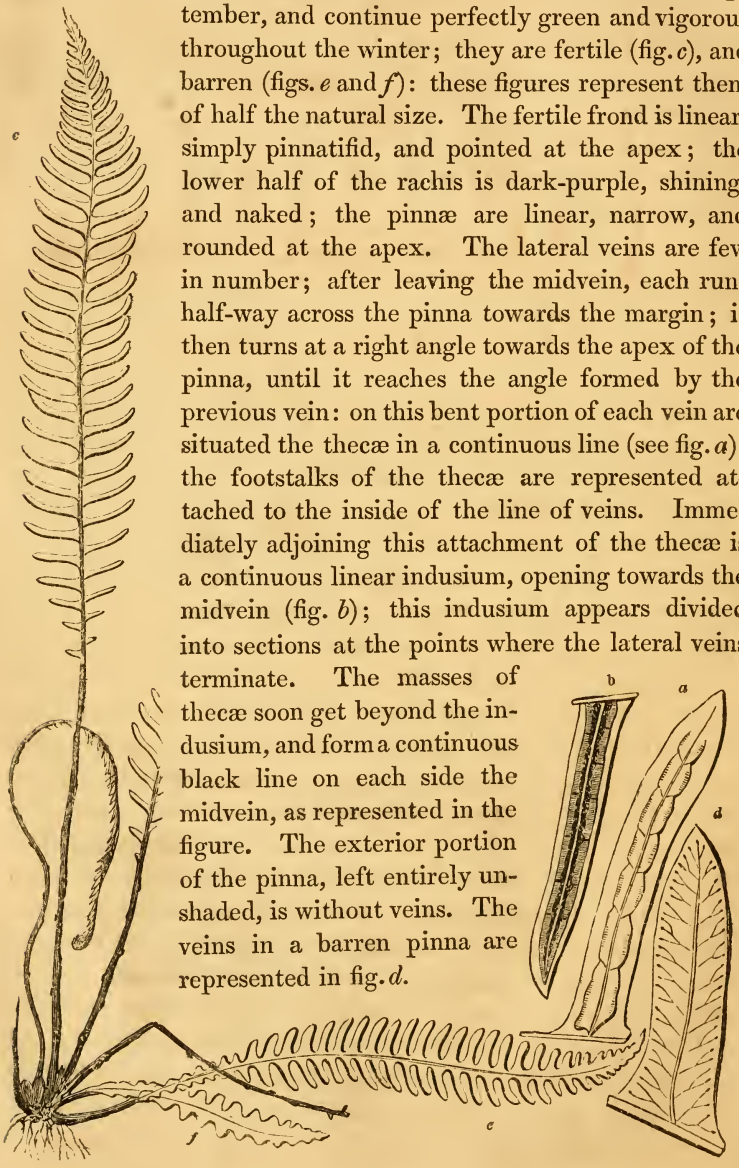
Blechnum Boreale.—Swartz, Smith, Hooker, Galpine, Mackay, Gray, Francis.

LOCALITIES.

England. Wales. Scotland. Ireland. } Universally distributed over waste ground, but particularly abundant in moist and mountainous districts.

The limits of the genus Blechnum, in which our present plant has usually been placed, appear less settled, and the characters less precisely determined, than those of any other Linnean group. The separation by Willdenow of the major part of the species, under the name Lomaria, does not appear to have been managed with that author's usual judgment. In his "Species Plantarum," he retains our only British example (the Osmunda Spicant of Linnæus) in his genus Blechnum, the species of which stand thus: 1. Unilaterale; 2. Boreale (Spicant, Lin.); 3. Onocleoides; and seventeen others. Presl, in his "Tentamen Pteridographiæ," removes Spicant to the genus Lomaria, and places it as the type, although he describes the genus as having marginal thecæ, which L. Spicant certainly has not. Sadler, in his little monograph of the Ferns of Hungary, &c. also describes Lomaria as having marginal thecæ and indusium, yet gives but one species—L. Spicant. Mr. Smith, of the Kew Botanic Gardens, restricts the genus Blechnum to those species in which the lateral veins are continued beyond the line of thecæ, and to the margin of the pinna; and the genus Lomaria, to those in which the lateral veins terminate in the line of thecæ: this character is so simple, and so readily observed in nearly all the species, that I am glad to employ it in fixing our British plant as a Lomaria.

Lomaria Spicant, usually called the Hard Fern, occurs on all our commons, heaths and forests; in the southern counties sparingly; in the northern counties, and in Wales, Scotland, and Ireland more abundantly. Its roots are black, very tough, and wiry; its rhizoma tufted and hairy. The young fronds make their appearance in May, arrive at maturity in August and September, and continue perfectly green and vigorous throughout the winter; they are fertile (fig. *c*), and barren (figs. *e* and *f*): these figures represent them of half the natural size. The fertile frond is linear, simply pinnatifid, and pointed at the apex; the lower half of the rachis is dark-purple, shining, and naked; the pinnæ are linear, narrow, and rounded at the apex. The lateral veins are few in number; after leaving the midvein, each runs half-way across the pinna towards the margin; it then turns at a right angle towards the apex of the pinna, until it reaches the angle formed by the previous vein: on this bent portion of each vein are situated the thecæ in a continuous line (see fig. *a*): the footstalks of the thecæ are represented attached to the inside of the line of veins. Immediately adjoining this attachment of the thecæ is a continuous linear indusium, opening towards the midvein (fig. *b*); this indusium appears divided into sections at the points where the lateral veins terminate. The masses of thecæ soon get beyond the indusium, and form a continuous black line on each side the midvein, as represented in the figure. The exterior portion of the pinna, left entirely unshaded, is without veins. The veins in a barren pinna are represented in fig. *d*.



BRAKES.—In Scotland, Brachen.

Pteris Aquilina of Authors.

Pteris femina.—Gray.

LOCALITIES.

England. Wales. Scotland. Ireland. } Universally distributed.

By a reference to Presl's "Tentamen Pteridographiæ," it will be seen that the Linnean genus Pteris has undergone much subdivision, and that our British species, Pteris Aquilina, is by that author referred to the genus Allosorus of Bernhardi; but, unfortunately, in this genus he has included species which scarcely possess a single character in common; and moreover the Allosori Aquilini, to which our species belongs, constitute the third and not the typical subdivision of the genus. It is therefore needful either to institute a new genus for the reception of the Allosori Aquilini of Presl, or to restore to them their ancient generic name. Not feeling competent to the former, I adopt the latter course, hoping that some professed botanist will ere long undertake to classify the heterogeneous species at present included in this extensive genus. The species of Pteris are distributed over every region of the earth, but by far the greater number are intertropical.

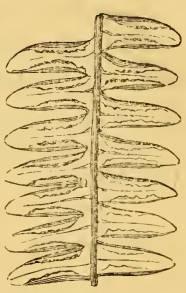
Pteris Aquilina, the common Brakes, is the most abundant of

our ferns; there is scarcely a heath, common, wood, or forest in any part of the United Kingdom, in which it does not make its appearance: its presence in great abundance is said to indicate poverty in the soil, but I am inclined to think that its absence from rich and highly cultivated land is rather to be attributed to the effects of the plough and hoe, than to any quality of the soil. It is one of those truly wild plants which fly from man, and take refuge in wastes and wildernesses. Its size is very unequal; it varies in height from ten or twelve inches to as many feet, but its average may be stated at three feet. In thick shady woods, having a moist soil, it grows to an enormous size; but in dry, gravelly, or sandy soils, it becomes very diminutive.

The roots are brown, fibrous, and tomentous. The rhizoma is brown, velvety, and most extensively and rapidly creeping; it generally runs in a nearly horizontal direction, but sometimes dips deeply and almost perpendicularly. When the London and Croydon Railway was in progress, I found in the New Cross cutting great abundance of these rhizomata in a decayed state, some of them extended to a perpendicular depth of fifteen feet. Whenever this fern has stood unmolested for a long series of years, the soil becomes filled with a complete net-work of its rhizomata. The young fronds make their first appearance in May, they are extremely tender, and the first shoots are almost invariably destroyed by the late frosts of spring; I have seen them cut down to the surface of the ground as late as the 20th of May. The young fronds come up bent or doubled, the leafy portion being pressed against the rachis, and not curled in a ring or circinate as we find it in most of our other ferns: the cut at the head of the preceding page shows a number of young fronds in various stages of development, and also the mode in which they spring from the rhizoma. The portion of the rachis below the ground is of a dark brown colour, velvety, and considerably stouter than the portion above ground; it closely resembles the rhizoma in its general appearance. When this incrassated portion of the rachis is cut through, either in a direct or oblique direction, the section bears a regular figure, as represented in the annexed cut, the left-hand section being direct, the right-hand oblique. This figure is by many said to represent an oak tree, and is called King Charles in the Oak; by others it

is supposed to resemble a spread eagle, hence the specific name of Aquilina given it by Linneus. The frond is killed by the first frosts of autumn, however slight they may be; it instantly turns to a deep brown colour, but remains perfectly undecayed, and frequently in an erect position during the whole winter.

The form of the frond is nearly that of an equilateral triangle, the base being somewhat but not materially the shortest of the three sides. The naked portion of the rachis is rather more than a third of the entire length of the frond; it is green, and rather pilose, rounded, and not "angular and sharp-edged, wounding the hands severely," as stated in the "English Flora." This statement must have crept in by some casual error, not being at all applicable to the present species. The pinnæ are pinnate, and the pinnulæ regularly cleft to their midrib, the lobes being rounded and entire; the first pinnula on the upper side of each pinna being smaller, and often undivided. Under ordinary circumstances all the fronds are fertile, but the apex of each frond is commonly barren.



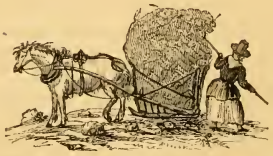
In the fertile pinnulæ the sides of the lobes are reflexed, the extreme margin being bleached and ragged, and forming a cover to the thecæ, which are arranged in a marginal series, and as they approach maturity are gradually protruded beyond this cover, and appear in two dark lines, parallel to the midrib of the lobe, as represented on the left side of the adjoining figure. The transverse veins are placed alternately on the midvein of the lobe; they are forked almost immediately on leaving the midvein, and the divisions are not unfrequently again divided before reaching the margin; all the veins are continued to the extreme margin of the green or leafy part of the lobe, and there enter a pulpy incrassated portion of the indusium, in which they become divided and disappear; and from this incrassated part the thecæ take their rise, as far as I can discover, in a continuous line; they are placed between two covers, which I will call indusia, although it is evident that both cannot be analogous to the indusium, in the genera Polystichum, &c. These two indusia may be detached with the thecæ adhering to them: the exterior terminates in a marginal fringe, or series of capillary segments. Owing to the great and almost invincible elasticity of the reflexed portion

of the lobe, it is difficult to obtain a satisfactory view of these parts, and still more difficult to represent them by a figure. In the annexed cut the lobe is supposed to be flattened: on the left

the unshaded portion represents the superior indusium thrown back; the inferior indusium is entirely removed, and the attachments of the thecæ are indicated along the margin of the shaded part; on the right the unshaded part represents both the indusia thrown back, together with the thecæ contained between them, the thecæ occasionally protruding beyond the indusia.

When the pinnula is barren, there is no trace of an indusium: the disposition of the lateral veins is very nearly as in the fertile pinnulæ, but they very obviously cease at the margin, which is without a channel or vein of any kind.

This is not only the most abundant but the most useful of our ferns: in Scotland, particularly in the Western Highlands, I observed it used for thatching cottages; in many parts of England it serves as packing for fruit and fish, and in Wales it is harvested as litter for horses. In wandering among the mountains of Wales I have constantly met with sleighs drawn by a ragged pony, and laden with Pteris by some industrious Welshwoman.



ROCK BRAKES.

ALLOSORUS CRISPUS.—Bernhardi, Sprengel, Sadler, Presl.
Osmunda Crispa.—Linneus, Hudson, Lightfoot, Bolton, Berkenhout.
Onoclea Crispa.—Roth.
Phorobolus Crispus.—Desveux.
Cryptogramma Crispa.—Brown, Hooker, Mackay, Francis.
Pteris Crispa.—Smith, Withering.
Stegania Onocleoides.—Gray.

LOCALITIES.

ENGLAND . . . Abundant on the mountains and about the lakes of Cumberland and Westmoreland; more sparingly on the mountains of Yorkshire and Lancashire.

WALES . . . . . Abundant on the mountains of Caernarvonshire; sparingly on Cader Idris; on Plinlymmon; on walls near Llyn Tregarien, Dolgelly, Tan-y-Bwlch, Aberglaslyn, Beddgelert, and Llanberris.

SCOTLAND . . . Mountains of Aberdeenshire, Argyleshire, Perthshire, &c. but not abundantly.

IRELAND . . . . Mourne Mountains, county Down; Liberties of Carrickfergus, county Antrim.

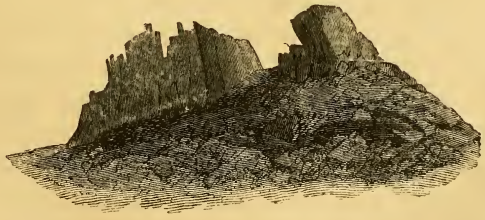
FOR separating this species generically from the three following, I am unable to assign any better reason than that every author has considered it distinct; it has by three eminent botanists been made the type of a new genus; viz. by Bernhardi, under the name Allosorus; by Desveux, under the name Phorobolus; and by Brown, under the name Cryptogramma. The name I have adopted has the claim of priority. The only characters distinguishing this plant from our British Polypodia are, that the fronds are both fertile and barren, and that the margin of the fertile pinnula is reflexed, covering the masses of thecæ. In a few species, nearly allied to A. crispus, the masses of thecæ are linear.

The root is fibrous, the fibres very numerous and tough, and tenaciously adhering to the earth or stones: the rhizoma is dark brown, and extends itself horizontally, but very slowly; and the plant, without a careful examination, appears to be tufted.

The fronds rise in May, and disappear with the earliest frosts of winter; they are fertile and barren. The fertile frond is nearly triangular; like that of Adiantum Capillus-Veneris, it is composed of a number of separate pinnulæ, each on a distinct foot-stalk: the pinnæ, as well as the pinnulæ, are alternate. The character of the barren frond is very various; its appearance is very crowded and crisped, like the leaves of parsley, but its divisions are intrinsically the same as those of the fertile frond; in both the rachis is slender, smooth, pale green, and naked for rather more than half its length; the colour of the frond is of a bright and beautiful green. The upper frond, represented opposite, is fertile, the other three are barren, and very various in the character of their divisions: a barren pinnula with its veins is shown at the bottom (fig. *e*). A fertile pinnula is represented at fig *a*, the margins being rolled over, attenuated, and somewhat bleached, and covering the thecæ, as in a state of nature: at fig. *b*, one margin is unrolled, showing the masses of thecæ on that side, together with their veins: at fig. *c*, both margins are unrolled, and the masses of thecæ, which are perfectly without indusium, shown in their natural position. The lateral veins are alternate, they are generally forked, and a mass of thecæ is attached at each extremity; the veins do not reach the margin; this is shown at fig. *d*. Each of the pinnulæ is somewhat auricled near the foot-stalk, on one side only. (See *a*, *b*, *c*, *d*.) The masses are composed of very few thecæ, which renders their form in

some degree uncertain, but the normal form is circular; it never exhibits any tendency to an elongate or linear figure; the attachment of the thecæ is in itself punctiform.

The Rock Brakes, Rock Parsley, or Parsley-leaved Fern, is a small plant, generally varying between four and eight inches in height: where abundant, its bright green fronds form a cheerful and pleasing contrast to the dark masses of weather-beaten and lichen-stained rock with which it is almost invariably surrounded. Although it occasionally condescends to seek a shelter in the crevices of old stone walls, its favourite site is among the shapeless masses of stone which are often strewn in such profusion down the sides of our mountains: except in such situations we rarely meet with it. In England its favourite habitat is in the lake district of Cumberland and Westmoreland: in the midland and southern counties it is entirely unknown; in Wales it flourishes in certain spots about the Snowdon range, but does not generally abound. In Ireland it is decidedly a rare plant, and I believe has only been found on the Mourne mountains by Mr. Mackay, and in the liberties of Carrickfergus by Mr. Moore. In Scotland, I believe, it is generally, although sparingly, distributed. In the course of a walk in the Highlands, in the summer of 1838, I noted at least forty localities where I observed it, but it was invariably in small quantities, generally a few scattered plants in the old walls, and amongst the stones shattered down by some convulsive movement of the earth beneath the summits of the more rugged mountains. One of its stations is on Ben Arthur, or "The Cobbler," the outline of whose black and rugged summit, which I sketched from near Arroquhar, is shown in the vignette below.



POLYPODY.

Polypodium Vulgare of Authors.

LOCALITIES.

England. Wales. Scotland. Ireland. } Universally distributed.

The genus Polypodium is another of those immense groups which require rigid investigation and careful subdivision. The species are universally distributed: generally speaking, they are not remarkable for beauty of appearance, but they are so various in figure and habit that no general observation can be strictly applied to them.

The common Polypody is one of our best known and most abundant ferns; it is to be found in almost every hedge. It abounds on stone walls, and on the surface of weather-beaten rocks, quickly succeeding the mosses and lichens which first establish a footing in these situations.

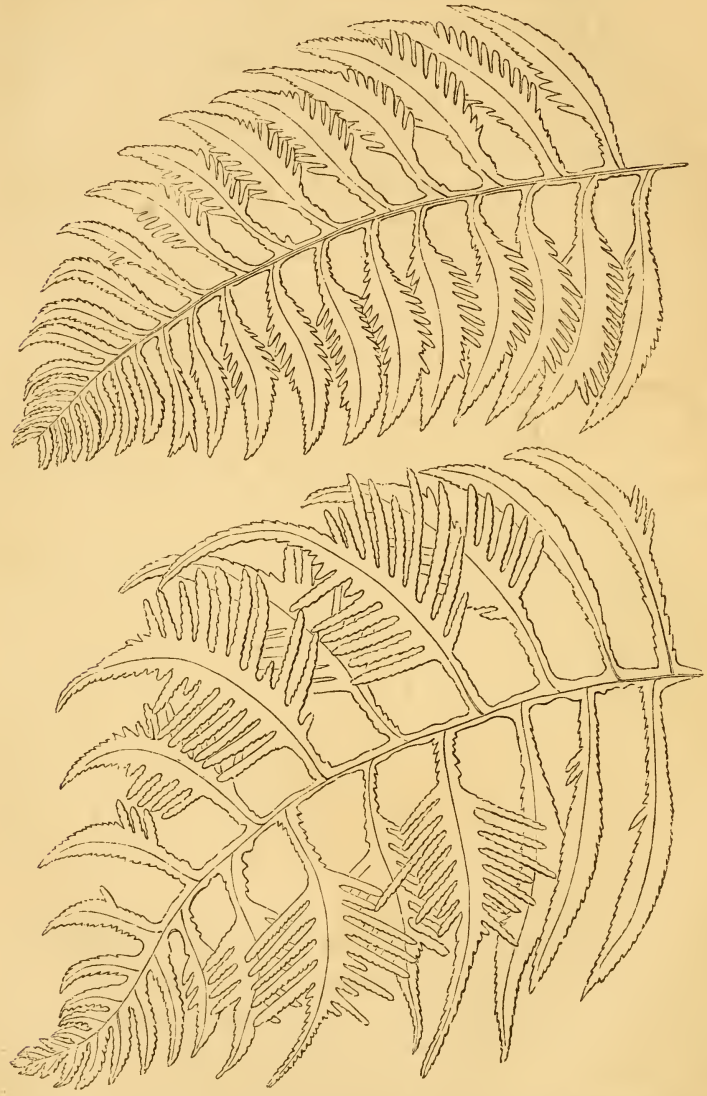
The roots are brown, and often clothed with a thick pilosity. The rhizoma is brown, and entirely covered with a densely pilose cuticle, which dries and peels off after one year's growth, leaving the rhizoma smooth; it is decidedly creeping, making annual advances of great extent. The young fronds are thrown out in May and June; they arrive at maturity early in September, and retain their full vigour until the fronds of the succeeding year make their appearance. The young fronds are generally erect at first, but droop by degrees, and are always pendent when mature: the rachis is green; more than one-third of its length is perfectly naked: the form of the frond is strap-shaped and pinnatifid, and acute at the apex; the pinnæ are nearly linear, and rounded at the apex; their margins are more or less serrated. The usual size is shewn in the detached pinnæ, represented in the preceding page. The fronds are fertile only, but the thecæ are generally confined to its upper part: when without fruit the imperfection arises from uncongenial situation, and the plant is not to be considered in a perfectly natural and healthy state.

The situation of the veins is shown in a detached pinnule (see the preceding page): the lateral veins are alternate, and each is divided into four branches, three of which extend nearly to the margin, and are incrassated at their termination; the fourth is directed forwards, and its termination, which is nearly equidistant from the midvein and margin, bears a circular mass of thecæ, which is entirely without indusium: a single lateral vein, its four branches, the attachment of the thecæ, and the extent of the circular mass, indicated by a dotted line, are shewn in the upper figure, to the right, of the preceding page.

In form of frond the Common Polypody is very uniform; it is however subject to a few variations, some of which are remarkable; the detached pinnule* to the left, bearing the masses of thecæ, shows a strongly serrated variety, and the entire frond to the right† has the termination of the pinnæ bifid: another variety, which is perfectly barren, is so strongly serrated, that Linneus considered it a distinct species, and described it under the name of Polypodium Cambricum: the identical frond, named and described by that great naturalist, is now in the

* See preceding page. † Ib.

possession of the Linnean Society of London: I have made a careful representation of it in the cut immediately below.



The lower figure represents a still more remarkable variety, found by Mr. Mackay, in the Dargle, in the county Wicklow; the frond represented was sent by Mr. Mackay to the late Sir J. E. Smith, and is also in the possession of the Linnean Society: it differs from the preceding variety, in being fertile.

In Ireland this species is much more subject to vary than in England, and I gathered a number of fronds in various parts of the county Kerry, which bear some slight resemblance to Mr. Mackay's beautiful variety; in those districts the frond is also much larger and wider, and grows with greater luxuriance. In England this fern has insinuated itself into the mortar of our walls, houses, churches, bridges, &c., and into our hedge-rows, and has become in a manner a domesticated plant, and does not enjoy so perfect a freedom as amid the humid, rocky, and shady dingles of Kerry and Wicklow.

The Common Polypody is somewhat parasitic, preferring the stem of a tree, or the half decayed stump of hazel and white-thorn bushes: over these its creeping rhizoma delights to wander. In the south-west of England it ascends the loftiest trees, and in Epping Forest I have often seen it ornamenting, with its bright green fronds, the heads of the pollard horn-beams, when the wintry blast has stripped them of their summer verdure.

BEECH FERN.

Polypodium Phegopteris of Authors.

Polypodium Latebrosum,—Gray.

LOCALITIES.

England . . . The mountainous districts of Northumberland, Durham, Cumberland, Westmoreland, Yorkshire, and Lancashire; near the town of Ludlow, Shropshire; on Shobdon Wood Hill, Herefordshire; and Dartmoor, Devonshire.

Wales . . . . . Rhaiadr, Hafod, Devil's Bridge, Ponterwyd, base of Plinlymmon; between Ponterwyd and Aberystwith, Machynlleth, Dolgelly, Dolymelynllyn, Llaneltyd; between Trawsvynydd and Maentwrog; between Harlech and Tan-y-Bwlch, Aberglaslyn, Beddgelert; between Beddgelert and Llyn Gwynnant; abundantly and almost continuously on the wall to the right between Llyn Gwynnant and the Pass of Llanberris; at Llanberris, Caernarvon, Cwm Idwel, Falls of Ogwen; Carnedd David; near Bangor; near Capel Carig; near Cernioge. In South Wales, at the falls of the Hepste, and several spots in the Vale of Neath.

Scotland. . . Luss, Tarbet, Arroquhar, Pass of Glencoe, Inverary, Oban, Isle of Mull, Ballahulish, Pass of Glencroe; near Tyndrum; near Killin; near Loch Katrine; Jardine Hall, Dumfrieshire; Corra Linn and Stone Byers, Lanarkshire; generally found in abundance near all waterfalls in Scotland.

Ireland . . . Mountain rills and waterfalls in the county Antrim; and at Powerscourt Waterfall, county Wicklow.

This fern is peculiarly the fern of waterfalls; its roots are black and fibrous; its rhizoma wiry, tough, and creeping, often forms a complete network over the perpendicular face of rocks within reach of the spray of waterfalls. In such situations this fern appears to delight. It throws out its new fronds in May, and they arrive at maturity in July, and disappear with the

early frosts on the approach of winter. The position of the frond is at first nearly horizontal, afterwards pendulous; its size varies from that of the frond represented in the figure to nine inches in length, exclusive of the naked part of the rachis, which is usually twice as long as that which is clothed. The figure of the frond is triangular, and acute at the apex; it is pinnate, the pinnæ being pinnatifid, linear, and very acute at the apex; the lower pair of pinnæ are turned back from the apex of the frond; they are united to the rachis by their stalks only: the remaining pinnæ point forwards, and are united to the rachis by their entire diameter; the fronds, including their rachis, are pale green and hirsute: they are fertile only.

The lateral veins of the pinnulæ are few in number, alternate, almost invariably undivided, and extend to the margin, each bearing a circular mass of thecæ near its extremity; these masses consequently form a submarginal series; they are of a brown colour. In one of the detached pinnules in the cut will be seen the position of the veins, and the attachment of the thecæ; in the other, the masses of thecæ in their natural situation.

This is not only a remarkably graceful, but a peculiarly well-marked fern: it is quite impossible to confound it with any other species; the long naked rachis, triangular form, marginal sori, and the unusual position of the lower pair of pinnæ, are quite sufficient to distinguish it.

The name of Beech Fern applied to this species seems very unmeaning: I am quite at a loss to discover the reason for its ever having been used. Like most of our English synonymes, it conveys an impression at variance with the nature and character of the plant. I only adopt it in order to avoid the responsibility of adding another name.

OAK FERN, or Wood Fern.

Polypodium Dryopteris of Authors.
Polypodium pulchellum.—Gray.

LOCALITIES.

England . . Northumberland, Cumberland, Westmoreland, Durham, Lancashire, sparingly; Yorkshire, at Arncliffe* and Richmond*; Cheshire; Shropshire, on the Titterstone Clee Hill; Herefordshire, on the north side of Shobdon Wood Hill; Derbyshire, at Matlock*, Buxton*, Dovedale*, &c. in profusion; Wiltshire, at Box Quarries*; Somersetshire, Cheddar Cliff*; Devonshire; Monmouthshire, near Tintern Abbey.

Wales . . . Anglesea, near Beaumaris; Caernarvonshire, Bangor, Rhaiadr-y-Wenol, Pass of Llanberris, Cwm Idwel, Snowdon, &c. &c.; Denbighshire, at Llangollen; Flintshire; Merionethshire, near Plinlymmon; Radnorshire, at Water-Break-its-Neck, and Craig-Pwll-du; Brecknockshire, at Brecon; Cardiganshire, at the Devil's Bridge and Ponterwyd; Glamorganshire, near Merthyr Tydfil.

Scotland . . Argyleshire, Perthshire, Dumfrieshire, Lanarkshire, in abundance; remarkably luxuriant at Loch Katrine, near Tannuilt, near Callender, and at Corra Lynn.

Ireland . . . County Antrim, a single plant on Knocklayd.

Polypodium Dryopteris is one of our most elegant and delicate ferns; it is almost entirely confined to wild and mountainous districts, and shuns the vicinity of human abodes; it prefers places overshaded by rocks or by thick foliage. The roots are black and fibrous; the rhizoma black, wiry, and creeping; in some situations, forming a dense mass like net-work. The young fronds make their appearance in March and April, each resembling three little balls on wires; these gradually unfold, and display the triple division. The fronds arrive at

* The plant called calcareum grows in these localities.

maturity early in summer, and disappear entirely before the winter; they are fertile only.

In describing the form of frond, it must be premised that, under the name Dryopteris, I am about to include the P. calcareum of Sir J. E. Smith, and I do this because I know of no differences by which I can distinguish them; and in order to bring the subject fairly before the reader, I shall quote verbatim Sir J. E. Smith's description, and give a figure of one of his specimens, being one of the very fronds on which he founds the species.

P. calcareum, Smith. "Frond three-branched: branches doubly pinnate, erect, rather rigid: segments obtuse, somewhat crenate. Masses of capsules crowded, finally confluent."—English Flora, iv. 283. Sir J. E. Smith further observes, that the rhizoma is shorter and less extended than in Dryopteris. "The frond is also more firm and rigid, its stalk more scaly about the lower part. All the three branches upright; smaller than Dryopteris, rigid, and not loosely spreading; masses of capsules more crowded, finally in some degree confluent, and of a browner hue."

Mr. C. C. Babington has pointed out to me another character, which seems to me of more value than either noticed by Smith. Mr. Babington observes—"P. calcareum may always be distinguished from P. Dryopteris by being covered with minute stalked glands, forming to the naked eye a mealy coat over the whole plant. This is never, as far as my observation goes, to be found in Dryopteris." Still, with regard to this character, I am compelled to add, that I can detect it in scarcely a tenth of the fronds which have been shown me as those of P. calcareum. A very obvious character, and one by which the varieties may be more positively and definitely settled, is to be found in the second pair of pinnæ. In Smith's Dryopteris, these second pinnæ have each a pair of sessile pinnulæ at their union with the rachis; and in the same author's P. calcareum these sessile pinnulæ are entirely wanting.

Mr. T. B. Flower, after giving me Brecon as one of his localities for P. calcareum, adds—"The Brecon plant would appear to be intermediate between P. calcareum and P. Dryopteris;" and I may observe that Mr. Flower appears well acquainted with the plants known by these names.

Mr. Francis, in his Analysis of the British Ferns, represents both species as having the rachis bent at the union of the branches, a character, according to Smith, possessed by Dryopteris only; he also represents the pinnulæ of the second pinnæ in calcareum completely pinnate, which is far from being the case in the original specimens: Mr. Francis also says, that "its frond is rather large in size," while Smith speaks of it as being smaller than Dryopteris. It is clear that the same plant is not intended; indeed, Mr. Francis's elegant figure represents a plant I have not seen.

Finally, Sadler, in his pamphlet, "De Filicibus Veris Hungariæ," a work displaying an intimate acquaintance with ferns, observes of P. calcareum—"This species is not yet sufficiently established; it differs from Dryopteris in its less size, the pinnulæ also being relatively less and almost entire, the masses of thecæ more or less confluent, and in having glandular hairs on the rachis, and *sometimes* also on the fronds."

The lateral veins are alternate, and either divided or simple, according as the pinnula or lobe in which they are found is more or less divided; each terminates at the margin, bearing a circular and perfectly naked mass of thecæ near its extremity.

The vignette below represents Eshing bridge, near Godalming, in Surry.

WOODSIA.

Woodsia Ilvensis and W. Hyperborea.—Brown, Smith, Sprengel, Hooker, Sadler, Francis.

Acrostichum Ilvense.—Linneus, Berkenhout, Hudson.

Acrostichum alpinum and *Ilvense.*—Bolton.

Polypodium Ilvense, hyperboreum.—Swartz.

Polypodium Arvonicum.—Withering.

Polypodium fontanum, of the Linnean Herbarium, is identical with *Woodsia hyperborea*, Brown.

LOCALITIES.

England. . Unknown.
Wales. . . . Caernarvonshire, Llyn-y-coon; on Glyder Vawr and Clogwyn-y-Garnedd; on Snowdon.
Scotland. . Perthshire, Ben Lawers; Forfarshire, Clova Mountains.
Ireland. . Unknown.

The genus Woodsia was established by Mr. Brown, in the Transactions of the Linnean Society of London, vol. xi. p. 170, and has been adopted by Smith, Hooker, Sprengel, and Sadler. The genus is founded on certain membranous scales attached below the thecæ, which Mr. Brown considers as analogous to the indusium of indusiate ferns. This membrane is somewhat cup-shaped, and its margin is divided into capillary segments, which appear scattered among the mass of thecæ, or sometimes incurved over them. Presl has returned the species of Woodsia to the genus Polypodium. I must confess my opinion that botanists generally will be unable to detect any analogy between the bristle-like appendages among the thecæ of Woodsia and the indusium so obvious in Asplenium and Polystichum, and will consider these bristles as identical with those which are scattered over the entire under surface of the frond. Nevertheless it seems so desirable to break into minor sections the heterogeneous mass of Polypodia, as they now stand, that it is with pleasure I avail myself of Mr. Brown's labours in the present instance.

There are said to be two species of the genus in this country: W. Ilvensis, represented by the upper plant in the figure, and W. hyperborea by the lower. The middle plant of the three is from a rock above Llyn-y-coon, on the Dog's Lake, a small pool

near the ascent of Glyder Vawr, from the Llanberris side, and I am uncertain to which of the supposed species it belongs. I believe Mr. Roberts, of Bangor, first discovered the plant in this locality, but I fear it is extinct, as this gentleman failed in his search after it, in company with Mr. C. C. Babington, in 1835, and I spent hours hunting diligently in the same place, in August, 1838.

Roots long, fibrous, brown. Rhizoma tufted, brown, slightly scaly: the young fronds appear in May, and last till September or October; the shape of the frond is linear, lanceolate, and pinnate; the pinnæ are attached by their stem only: they are indented but not pinnatifid. Sadler, who appears to consider the plants distinct, thus characterises them:—*De filicibus veris*, &c. p. 45.

W. hyperborea. "Frond linear, lanceolate, pinnate, beneath pubescent: pinnæ nearly ovate, obtuse at the base, unequally cuneate, nearly sessile, obtusely lobato-pinnatifid; masses of thecæ becoming nearly confluent; stipes smooth, rachis pilose."—Sadler, l. c.

W. Ilvensis. "Frond oblong, pinnate, beneath hairy; pinnæ opposite, lanceolate, pinnatifid; the lobes oblong, obtuse; the lower ones spreading: masses of thecæ confluent; stipes and rachis scaly-villose."—Sadler, l. c.

A small portion of the rachis is naked, the veins are irregularly distributed, frequently the midvein is not to be traced without difficulty, no single vein appearing to have a superiority over the rest: none of the veins reach the margin, and each at its extremity bears a mass of thecæ.

The plants are represented of the natural size; the two pinnæ detached are magnified, the upper shows the masses of thecæ in their natural situation, the lower exhibits the veins, and the points of attachment of the thecæ at their extremities, the thecæ themselves being removed.

THE BRITTLE FERN.

CYSTOPTERIS FRAGILIS.—Bernhardi, Presl.
Cistopteris dentata, fragilis, and *alpina.*—Hooker, Francis.
Cystea fragilis, dentata, angustata, and *regia.*—Smith.
Polypodium fragile.—Linneus, Hudson, Lightfoot, Berkenhout.
Polypodium fragile and *rhæticum.*—Bolton.
Polypodium fragile, dentatum, and *trifidum.*—Withering.
Aspidium fragile.—Sadler.
Cyclopteris fragilis, Athyrium dentatum and *regium.*—Gray.

LOCALITIES.

ENGLAND . . Northumberland, Cumberland, Westmoreland, not uncommon; Yorkshire, near Richmond; Lancashire; Cheshire; Shropshire; Derbyshire, Matlock, Buxton, Dovedale, and the Quadrangle of Haddon Hall; Somersetshire, near Bristol; Bath and Cheddar Cliffs; Gloucestershire, Painswick on walls; Devonshire; Cornwall.

WALES. . . . Caernarvonshire, in various localities; at Cwm Idwel in profusion; Denbighshire, Dinas Bran, near Llangollen, and near Wrexham; Merionethshire near Maentwrog; Montgomeryshire, Craig Breidden and Cwm Istwith; Radnorshire, Craig-Pwll-du; Brecknockshire, Brecon; Carmarthenshire; Glamorganshire.

SCOTLAND . . Throughout the Western Highlands, and in localities too numerous to mention.

IRELAND. . . County Antrim, Red Bay, and Glenarriff; county Sligo, near Sligo in profusion; county Galway, various localities in Cunnemara; county Kerry, various localities.

THE genus Cystopteris was established by Bernhardi, and appears to have been adopted by nearly all subsequent botanists; it contains but a limited number of species, all of which frequent moist or mountainous districts, rooting in the fissures of rocks, or the interstices of stone walls. They are plants of small size, of erect but elegant growth, and are of a remarkably brittle character, whence the excellent specific name of fragilis. In this country we have but one of these species, and on this much labour, perseverance, and ingenuity have been expended, in the hopes of exalting some of the more remarkable of its Protean fronds to the dignity of species. So absorbing is this spirit of species-making, that I believe nothing less than a month's ramble in the Alpine districts of Caernarvonshire or Argyleshire could possibly undeceive these who have thoroughly imbibed a belief in the validity of these species; and as those who are strongest in the study are frequently the weakest on the mountains, I doubt not that many will long cherish them with unwavering faith.

Polypodium fragile of Linneus and other authors, in its most common form, appears to be the Cystea fragilis of Smith, and is represented in Sowerby's English Botany, pl. 1587, and in Bolton's Filices, pl. 45. As Sir J. E. Smith has taken more pains with this genus than any other of our authors, I shall give his descriptions at length, accompanied in every instance by the figure of a frond, carefully compared with the specimens from which the description is compiled.

Cystea dentata, Smith. *Polypodium dentatum*, Dickson. Rather smaller than Cystea fragilis, but agreeing with it in texture, colour, and general aspect. Rhizoma tufted, small. Frond for the most part *correctly bipinnate*, a few of the lower pinnæ only, in luxuriant specimens, being pinnate or pinnatifid; the pinnulæ are exactly ovate, or *rounded, obtuse, pointless*, copiously and bluntly serrated or toothed: their ribs wavy; their base not decurved, though seated on a winged midrib; masses prominent, at length entirely confluent, of a uniform rich chestnut brown. I do not perceive in the younger ones that peculiar blackness which is observable in P. fragilis. The cover is short, jagged, and concave. I have never seen it in an early stage before bursting.—Eng. Flora, iv. 300.

Sir J. E. Smith has described this species, as far as regards the leading characters of the fronds, with great accuracy; but he has made his species too lax by introducing into it a variety of specimens from Llangollen and Anglesea, which have nothing to do with Dickson's plant. The original plant is solely Scotch, and is the only form of fragilis which I could find on the northern shoulders of Ben More, where it is most abundant, descending even to the walls on the road side between Killin and Tyndrum. Sir J. E. Smith appears to have known nothing of the plant but from a dried frond: he makes no allusion to the reflexed, drooping, and convex pinnæ of the young fronds, or the more marginal arrangement of the sori, the only characters about

the plant which can be considered specific: indeed so striking were these characters to me, that I quite believed it a species until I had obtained an intermediate series of forms.

The next variety I consider to be the typical form of P. fragile, as described by Linneus.

Cystea fragilis, Smith. Fronds several together, from four to ten or twelve inches high, lanceolate, pointed, smooth, of a full though bright green, doubly or almost triply pinnate. Rachis brown or blackish, very brittle and juicy, occupying one-third or nearly half of the length of the whole, destitute of scales, except at its very base. The pinnæ are usually nearly opposite, acute, and of a moderate length; the pinnulæ mostly alternate, ovate, acute, or pointed; their base always tapering and decurrent; they are by no means linear or oblong, nor is their margin wavy, but copiously, deeply, and sharply toothed, and their substance is firm; the lower and larger ones are deeply pinnatifid, their lobes resembling the upper pinnulæ. Masses numerous and crowded, globular; *at first pale, but finally blackish* and confluent, covering the whole back of the frond. Indusium white, flaccid, membranous, concave, irregularly jagged and torn, sometimes lengthened out into an oblong point, but soon turned back and obliterated, or forced off by the swelling, shining thecæ, which, in *an early state, are often quite black, though subsequently browner.*—Eng. Flora, iv. 299.

In this description a discrepancy occurs in the colour of the thecæ; the colour of the masses, in an early state, is very inconstant, but generally blackish; the autumnal fronds, when in cultivation, have smaller masses than the vernal, the masses also are rarely confluent, the frond itself is more minutely divided.

I now proceed to a plant of very remarkable character, and one which at first sight would perplex many an able botanist; and

here it seems necessary to add that this, or something closely approaching it, is the Polypodium rhæticum of Dickson, Withering, and Bolton, the Polypodium rhæticum of Linneus being nothing more than a frond of Polypodium Filix-femina of the same author.

Cystea angustata, Smith. Rhizoma tufted, or somewhat creeping (!), black, with long fibres and rusty scales. Fronds several, erect, twelve or fifteen inches high, of which the slender blackish, smooth, and naked rachis occupies more than a third, sometimes nearly half; the midrib is still more slender, and, like every other part, quite smooth, without any membranous border. Pinnæ bright green, from twelve to fifteen pair, of a moderate length, nearly opposite, and taper-pointed; the lowermost rather shorter and more remote from the next than those about the middle of each frond; all pinnate, with a scarcely bordered midrib. Pinnulæ about ten on each side, alternate, lanceolate, decurrent, rather bluntly pointed, sometimes tapering to the extremity; all either deeply pinnatifid, with acute, oblong, wavy segments; or, in less luxuriant plants, slightly pinnatifid, or only wavy at the margin; the ribs of all more or less wavy. The ultimate divisions, in every instance, are oblong or linear, never dilated, rounded, or ovate; they are sometimes, though seldom, notched or cloven at the end. By this linear or oblong mode of division, and its thinner more pliant texture, the present may readily be known from the preceding, with which it has generally been confounded. The masses, much smaller and less prominent than in those species, always continue distinct, standing either solitary or in pairs, towards the bottom of each lobe or tooth, and are round, at first pale, and subsequently brown.—Eng. Flora, iv. 502.

The frond to which Sir J. E. Smith refers as having been found at Gordale, in Craven, still remains in his Herbarium, and is figured above.

The fourth and last variety noticed by Smith, and one which Professor Don considers distinct as a species, is called Cystea regia by Smith, who supposes it to be the Polypodium regium of Linneus. (I have carefully examined the specimens preserved under this name in the Linnean Herbarium; these are three in number:—the first appears to be the normal form of fragilis, although the specimen is injured; the second is the species known by our cultivators as Asplenium fontanum, and the third is the Polypodium dentatum of Dickson.) The only habitat of this plant is a wall at Low Layton in Essex; the plant received by Smith from Snowdon being very different in appearance, although by that author labelled and even described as identical. Whether this plant emanates from seeds of fragilis or regia is of little moment; it must have escaped from a cultivated specimen, and therefore cannot be considered as in a native habitat.

Cystea regia, Smith. Rhizoma tufted, scaly. Fronds several, from three to ten or twelve inches high, bright green, lanceolate, twice pinnate, pinnatifid, and finely cut, of a most elegant appearance, quite smooth in every part except a few membranous, torn, pointed, brown scales at the very bottom of the stalk, which is less brittle and juicy than that of C. fragilis. Pinnæ and pinnulæ more generally alternate than opposite; the former with a narrowly-winged or bordered midrib; the latter ovate, obtuse, deeply pinnatifid, with elliptic, oblong, obtuse, partly cloven, or notched segments, but not elongated, linear, or wavy at the margin like C. angustata; neither are the ribs zigzag as in that species. Masses of thecæ very copious, but small, pale, and scattered, not crowded, nor do they even appear to become confluent. In a young state each is wrapped up in a white membranous concave cover, terminating in a tapering, more or less jagged, point, nearly agreeing with C. fragilis; but the masses are much smaller, and the thecæ of a pale brown, never black.—Eng. Flora, iv. 303.

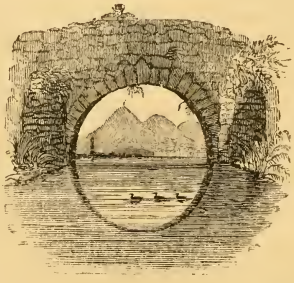
A sketch of a frond gathered from the wall at Low Layton accompanies the description.

Having now pointed out the characters by which these four

plants may be distinguished from each other, I must add that I consider the extreme difference between dentata and angustata is lost sight of when an intermediate series, running through the original fragile, is carefully examined; and further, that regia no where exists in a native habitat in this country, and is not therefore to be considered as connected with the inquiry: having said this, I shall make no attempt to enforce my opinions, but leave the judicious botanist to form his own.

The lateral veins are alternate, and each is usually divided into three or four branches, one extending to every serrature in each lobe of the pinnula. The lower detached figure in page 33 represents a pinnula, showing the veins and points of the attachment of the thecæ; the figure immediately above it represents a lobe of the same pinnula; almost every vein bears a mass of thecæ near its extremity, the mass is circular, and is covered by a loose white membranous indusium, which is attached on one side only, beneath the thecæ; its margin, at the farthest extremity from its attachment, is striated, and becomes split into capillary segments, or sometimes torn in a ragged manner, and at length entirely disappears: the masses of thecæ rapidly increase in size, at last becoming confluent (see page 32), where the apex of a frond with confluent masses is represented to the left of the cut. In cultivation I have observed that sometimes from the plant receiving a check from exposure or improper treatment, the masses remain of small size, and covered with the indusium, even after the frond has withered.

This fern, in the wild parts of Scotland, Wales, and Ireland, is particularly fond of bridges, where it establishes itself in the interstices of the stones.



COMMON PRICKLY FERN.

POLYSTICHUM ACULEATUM.—Roth, De Candolle, Schott.
Polypodium aculeatum.—Linneus, Hudson, Lightfoot, Bolton.
Aspidium aculeatum, angulare, and *lobatum.*—Smith, Hooker.

LOCALITIES.

ENGLAND.
WALES.
SCOTLAND.
IRELAND.
} Universally distributed.

THE genus Polystichum contains the most Protean of all our ferns. In the Magazine of Natural History, (New Series, vol. ii. p. 48,) I have endeavoured to prove that we possess but a single species of this genus; and the introduction of a second, in this monograph, although accompanied by an expressed doubt, will show that the views I then entertained have been somewhat modified, if not abandoned, by subsequent observation. This genus was established by Roth, and has been adopted by De Candolle and Schott; it contains but few species, and these are mostly inhabitants of temperate climates.

Polystichum aculeatum, the Polypodium aculeatum of Linneus, may be considered one of our commonest ferns. I have seen it more or less abundantly in every county I have visited, whether in England, Wales, Scotland, or Ireland. It seems to delight in the protection of man, its favourite habitat being our hedgerows, and its luxuriance is greatly increased by cultivation, or even by its vicinity to cultivated lands; its occurrence on our moors, commons, and mountains is comparatively rare, its stature diminutive, and its appearance often unhealthy.

The roots of Polystichum aculeatum are unusually long, strong, and tough; its rhizoma thick, tufted, and extremely chaffy. The young fronds make their appearance in April and May, the apex being circinate, bent backwards, and remarkably graceful in its appearance: the pinnæ of the young frond are also circinate (see the vignette at p. 42.) The fronds attain their

full expansion in July, and the seed appears to have reached maturity in September. The fronds are perfectly evergreen; they continue throughout the winter entirely uninjured by the severest frosts, and linger on till late in the succeeding summer: they are of so rigid and durable a character, that I have often been able to detect the growth of four successive summers still attached to the same rhizoma; not indeed all of them green and flourishing, but perfectly undecayed; and it was in this way that I first discovered that the same rhizoma produced fronds of widely different character.

The general form of the frond may be termed lanceolate, but no general description of its cutting will be applicable to all its varieties. The frond at the head of the preceding page, together with the pinnæ (figs. *a* and *b* in the annexed cut) represent the variety described in the English Flora, under the name of Aspidium angulare. In cultivation this variety has become even more light and feathery, as represented at fig. *θ*, page 37. I do not take the name merely from the description, although that is sufficiently accurate, but from a careful examination of the fronds in the Smithian Herbarium, from which the description was undoubtedly compiled. The frond is pinnate; the pinnæ also pinnate; the pinnulæ more or less distant, seldom touching each other, stalked, obscurely ovate, serrated, spiny, and each auricled or lobed at the base, the lobe pointing towards the apex of the pinna; the pinnula nearest the rachis on the upper side of the pinna is always in a greater or less degree superior in size to the rest. Sometimes this pinnula is distinctly divided into lobes. (See figs. *β γ* in the annexed cut.)

The pinna fig. *c* represents the variety to which Sir J. E. Smith retains the Linnean name of aculeatum, and describes its pinnulæ as "pointed, and somewhat crescent-shaped." I selected for cultivation a specimen closely agreeing with that in the Smithian Herbarium, and find it now produces pinnæ resembling fig. *b*.

The frond in the above cut, marked A, rather interrupts the series, from its remarkably elongate and linear form, and from having its pinnæ placed at right angles, or nearly so, with the rachis: in the division of the pinnæ it presents no remarkable characters. I am indebted to Mr. H. Doubleday, of Epping, for specimens of this plant; the effect of cultivation has not, in this instance, been ascertained.

All the fronds and pinnæ represented above would be placed by Sir J. E. Smith in his species Aspidium lobatum. The *pinnæ d, e,* and *f,* are carefully copied from central pinnæ of three fronds, so named in the Smithian Herbarium, and the *fronds e* and *f* are drawn from living fronds, which precisely agree with the dried ones, from which the pinnæ marked with the same letters are copied; *g* is a pinna from a frond less divided than *f,* and *h* a seedling frond, found in company with the fronds *e* and *f*; a pinna is detached to show more clearly its spiny appearance. Smith describes lobatum as having the fronds narrower, and the pinnæ shorter, than aculeatum. "The pinnæ are also more crowded, especially at the base, where the foremost pinnula of each lowermost pair lies close to the midrib, and is much larger than any of the others."

The colour of this variety is a brighter lighter green than angulare, and the upper surface much more glabrous; but these, as well as the characters pointed out by Sir J. E. Smith, gradually disappear with cultivation, and in a few years are wholly obliterated.

The preceding forms, particularly fig. *h* in page 39, have prepared the reader for the lonchitiform or simply pinnate variety of this variable plant. In the Smithian Herbarium is a frond, the aculeatum, *β.* of the English Flora, which was found on the Welsh mountains, and of which the pinnæ are nearly as entire as in the accompanying cut, and of this Sir J. E. Smith says, "it is sometimes taken for A. Lonchitis." The fronds represented in the margin (fig. *i*) were found by myself at Twll-du in Caernarvonshire; they were apparently the growth of 1837, although obtained in 1838, and the rhizoma was actually producing young fronds, divided as in lobatum; in cultivation this plant has produced the lobatum form only.

The veins of course vary greatly in accordance with the divisions of the frond; they are always unconnected with each other at the extremity, a character which separates this genus from Aspidium. In the pinna in the annexed cut the lateral veins are three-branched; of these the anterior branch bears a mass of thecæ near its extremity, and is not continued like the others to the margin of the pinna. The indusium is orbicular, scale-like, and attached by a stalk in the centre; it shrivels, decreases, and falls off or disappears in the centre, as the thecæ approach maturity: the masses of thecæ are circular and rarely confluent: they occur only on the upper part of the frond.

I have carefully compared the frond from which fig. *i* is drawn with the two

specimens of Polypodium Lonchitis in the Linnean Herbarium, and I am totally unable to detect any difference between them; I am therefore of the opinion that had the plant from which these fronds were gathered been transplanted to a hedge-row in which its roots could reach abundance of decaying wood, that it would speedily have become broken into lobatum, and before many years into angulare.

Although our botanists have named four forms of this fern, I believe there are but three which will be generally understood; all these I would consider as constituting but a single species, to which I would assign the Linnean name of aculeatum, and call the different forms merely varieties, thus :—

Var. 1.—Angular type. Frond doubly pinnate; pinnulæ ovate, bluntish, stalked and auricled at the base; the whole plant light, feathery, graceful, and extremely flexible: this form is figured at page 37.

Var. 2.—Lobate type. Frond doubly pinnate; pinnulæ pointed, decurrent, serrated, the foremost of the lower pair on each pinna very large and pointing towards the apex of the frond; the whole plant rigid, heavy, compact, and unbending; grows in general horizontally: this form is figured at page 39.

Var. 3.—Lonchitiform type. Frond simply pinnate; pinnæ stalked, undivided, prickly; habit weak, flexible, pendulous: this form is figured at page 40.

Mr. Francis has figured all the varieties of this plant as having the reniform fructification of the genus Lastræa. Fig. 1, 2, and 4, plate 2, belong to the lobate type of the above list; figs. 1 and 4 correspond with my figure *f;* figs. 3 and 5 of Francis belong to the angular type.

As many of our botanists will be inclined to smile at my attempt to blend together species which they have been accustomed to consider as perfectly distinct, I will mention that since the publication of my remarks in the Magazine of Natural History, I have received various written communications on the subject, some of them from botanists who in some degree participate in my views; for instance, the following from Mr. C. C. Babington. "I am inclined to consider lobatum, aculeatum, and angulare, as forms of one species; many intermediate states occur in which it is quite impossible to say to which of the supposed species they ought to be referred; some

specimens of lobatum approach very closely to Lonchitis, particularly the variety named lonchitidoides, which is shown not to be a young form of lobatum, but a distinct form by its bearing fructification. When I had the pleasure of seeing the younger Agardh in England, I mentioned to him my suspicion *that Lonchitis would be found to belong to the same species as lobatum, aculeatum, and angulare*, when he informed me that it could not be considered a mountain form of these, as I suspected, because it was the most common species throughout the flat countries of Sweden."

Sadler sinks lobatum as a synonyme of aculeatum, not noticing it as a variety, but he raises to the rank of a species, under the name munitum, that variety of the lobate type which has "the frond pinnate, the pinnæ lineari-lanceolato-subfalcate, and pinnatifid at the base." I cannot doubt that this is the plant alluded to by Mr. Babington as bearing the name of lonchitidoides, and represented *ante*, page 39, fig. *f*.

In the Annals of Natural History, I find in some botanical notes of a tour in Ireland by Mr. J. Ball, of Cambridge, a passage so completely in accordance with the views I have expressed, that I cannot resist the temptation to quote it. "At Colin Glen, a few miles from Belfast, in ascending from the lower woody part of the glen to the rocks at the summit, the botanist can scarcely fail to remark the gradual transition from a very divided form of Aspidium angulare through the forms named aculeatum and lobatum to one on the rocks above, which cannot be distinguished from A. Lonchitis."—*Ann. Nat. Hist.* Vol. ii. p. 29.

ALPINE PRICKLY FERN.

POLYSTICHUM LONCHITIS.—All the authorities are doubtful.

LOCALITIES.

ENGLAND. }
WALES. } Not decidedly ascertained.
SCOTLAND. }
IRELAND... County Donegal, Rosses and Thanet Mountain Pass; County Sligo, Ben Bulben.

UNTIL my late visit to Ireland, I felt perfectly convinced that the species Lonchitis and aculeatum were identical, that Lonchitis was the young or seedling form of the plant prevented by situation from acquiring its normal or perfect form, and that aculeatum was the same plant in its normal or perfect form. I traced the plant beyond all dispute from the simply pinnate frond represented at page 40, to the more compound fronds *f* and *e*, (page 39), and I not only found that the plant advanced from *i* (page 40) to *f* (page 39), and from that again to *e* (page 39), but I found that by reversing the treatment, it could be compelled to retrograde, and reassume the simply pinnate form represented at *h* (page 39).

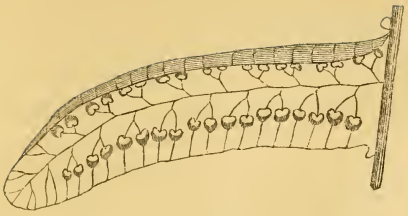
In the Botanic Garden at Belfast I have since seen a plant of a totally different character: on this, long cultivation had produced no trace of a similar effect—in fact, a contrary effect was obvious, for it not merely bore the Lonchitis characters, but bore them to an excess, and had departed further from any trace of aculeatum character than any specimen of Lonchitis that I had ever seen. I afterwards found the same plant in the College and Glasnevin Botanic Gardens at Dublin, and in these also it presented its peculiar characters with unvarying fidelity. I am equally at a loss how to place this stubborn and unvarying plant with aculeatum, the most Protean of all our species, and how to give figures and assign characters to each, which shall clearly distinguish it from the other.

The roots of the present plant are long, strong, black, and wiry; the rhizoma is thick, tufted, and scaly; the fronds appear

early in the spring, arrive in perfection in August and September, and remain in perfect vigour throughout the winter. The fronds are always fertile. The form of the frond is linear, lanceolate, and pinnate; the pinnæ are crowded, and extend quite to the base of the rachis, which is clothed with chaffy scales: the pinnæ are somewhat crescent-shaped, auricled on the upper side next the rachis, and serrated, the serratures being acutely spiny; each pinna is somewhat twisted, the auricled portion projecting behind the frond, which is altogether extremely rigid, and grows in an erect position; it is of a deep shining green colour, and almost as stiff and prickly as a spike of little holly leaves; so much so, indeed, that the fronds are not flattened for drying without considerable difficulty.

In the Irish specimens the masses of thecæ are most abundant towards the apex of the frond, but are scattered throughout the other parts, even to its base; whereas, in the specimens usually named Lonchitis, from Scotland and Wales, the masses are confined to the upper part of the frond. The Irish plant is very scaly at the back, a character scarcely observable in those from Scotland and Wales.

I have already said that I believe the Linnean Lonchitis to be identical with my lonchitiform variety of aculeatum; it may then be inquired how I can presume to give the Linnean name to a new plant; in reply, I observe, that the name of Lonchitis will never be abandoned while there is a single botanist who believes that Lonchitis and aculeatum are distinct; if, therefore, Lonchitis, as a name, is to be retained, let us apply it to that plant which is unvarying.



MARINE BIOLOGICAL LABORATORY
WOODS HOLE
LIBRARY
MASS.

MARSH FERN.

LASTRÆA THELYPTERIS.—Presl.
Thelypteris palustris.—Schott.
Aspidium palustre.—Gray.
Aspidium Thelypteris.—Swartz, Smith, Hooker, Galpine, Mackay, Francis.
Acrostichum Thelypteris.—Linneus, Bolton.
Polypodium Thelypteris.—Withering, Berkenhout, Lightfoot, Hudson, (his specimen in the Smithian Herbarium is undoubtedly correctly named Thelypteris.)

LOCALITIES.

ENGLAND . . . Northumberland, Learmouth Bogs, near Cornhill; Cheshire, from various localities, without further particulars; Cambridgeshire, Whittlesea Mere; Norfolk, Filsby, Ormsby, Bolton Bay, Horning Marshes; Kent, Ham Pond, near Sandwich, in the marshy meadows, and filling the wood to the exclusion of other ferns; Isle of Wight, marsh near Freshwater gate.

WALES. SCOTLAND. } Unknown.

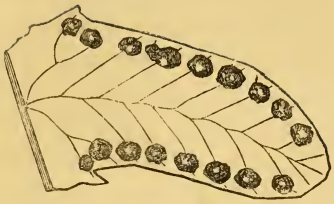
IRELAND . . . . County Antrim, near the north-east coast of Lough Neagh.

LASTRÆA THELYPTERIS, the Marsh Fern, is one of our rarest or, rather, our most local species: it is so commonly confounded with Oreopteris, that the localities usually given for either are of but little value: each of those recorded above may be strictly depended on. In England it appears widely distributed, and in Wales I think it has occurred in several unrecorded spots. In Ireland I believe it has only been found in the banks of Lough Neagh, by Mr. Moore, of the Glasnevin Botanic Garden; and in Scotland, to the best of my belief, it is at present totally unknown. It is only found in wet and marshy ground, where its black, slender, and wiry rhizoma, can creep to any extent without impediment from the substance of the soil; its roots are black, fibrous, and, in some instances, very long; they appear to

penetrate deeply in the bog, while the rhizoma spreads widely and horizontally, but never penetrates far below the surface.

The fronds are both barren and fertile. The barren fronds rise from the bog in May, the fertile ones in July: they both disappear with the first frosts of winter. The frond is lanceolate and pinnate, the lowermost pinnæ are shorter than the third and fourth pairs; they are attached by their stalk only: about one-third of the rachis is without pinnæ; the pinnæ are pinnatifid, the pinnulæ rounded, and always entire: the whole plant is erect, very slender, delicate, and fragile; it is of a pale green colour; in size, it varies from that of the frond represented in the annexed cut, to at least four times the size: the fertile fronds are larger, and of stronger growth than the barren.

The lateral veins are alternate, they are forked almost immediately on leaving the midvein, and each proceeds to the margin of the pinnula; each bears a circular mass of thecæ almost immediately after the fork: the lower detached pinnula exhibits the veins and the attachment of the thecæ; the upper detached pinnula shews the thecæ *in situ* on one side, and on the other the margin of the pinnula (which is attenuated, paler, and convolute,) covering the thecæ: between the rhizoma and the pinnula, shewing the veins, is a fertile pinna, seen from above; the pinnulæ being narrower to appearance, owing to the convolute character of their margin. Each mass of seeds has, in an early state of the plant, a small subreniform indusium attached on one side to the vein, at the point to which the stalks of the thecæ are attached. This is shewn at the top of page 45.



MOUNTAIN FERN.

LASTRÆA OREOPTERIS.—Presl.
Aspidium Oreopteris.—Swartz, Smith, Hooker, Galpine, Mackay, Francis.
Aspidium odoriferum.—Gray.
Polypodium Oreopteris.—Withering.
Polypodium fragrans.—Hudson, Berkenhout.
Polypodium Thelypteris.—Bolton.

LOCALITIES.

ENGLAND. . . In the northern counties very common; Shropshire, on the Clee Hill; Derbyshire near Matlock; Nottinghamshire, near Linby; Northamptonshire; Herefordshire, at Amestrey quarry and Shobdon Park; Oxfordshire; Wiltshire, not common; Somersetshire; Sussex; Kent, Tunbridge Wells, Blackheath; Essex, Epping Forest; Middlesex, Hampstead Heath; Norfolk.

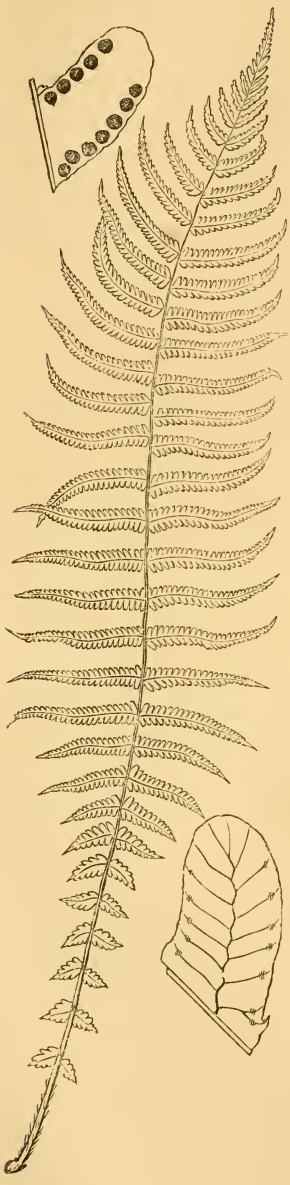
WALES .... In North Wales abundant on all the mountains; in Radnorshire, at Water-break-its-neck, covering acres of the mountain; Brecknockshire; Merionethshire; Cardiganshire; Glamorganshire.

SCOTLAND . . On all the mountains.

IRELAND . . . County Londonderry, Muff Glen and Glen Roe; County Donegal, vicinity of Milroy Bay; County Kerry, near Muckruss sparingly, and very slender; (is this the Thelypteris of Mackay?) County Wicklow, at Glendalough, most abundant.

THIS fern, as its name implies, is an inhabitant of mountains, and is rarely found in low situations, or cultivated districts. It is particularly abundant in the Highlands of Scotland, in many districts completely taking the place of Pteris Aquilina. It also abounds in the hilly parts of Northumberland, Durham, Cumberland, Westmoreland, Yorkshire, and Lancashire, and again in

North Wales. In the midland, and even southern counties of England, it is met with, but not in abundance.



It has numerous, strong, tough, and penetrating roots, which spread in every direction from a large, scaly, and nearly spherical rhizoma, which yearly increases in magnitude. In favourable situations, this is capable of sending forth thirty, forty, or even fifty fronds, which spread with but little regularity round a common centre. Immediately these begin to unroll, they exhibit the pinnæ placed at right angles with the rachis, as represented in the vignette in the next page, a character particularly worthy of notice, because very unusual amongst our ferns. The fronds, when fully expanded, are very variable in size, dependant in a great measure on the age of the plant. An extraordinary number of the seedlings of this plant are occasionally to be met with. For two or three years they bear little or no fruit, but after the third year fructification appears in abundance, and from that period all the fronds are fertile. Ray thought the seedling of this plant a distinct species, and Sir J. E. Smith has recorded it as a variety.

In the figure of the frond there is little or no variation; it is elongate, lance-shaped, regularly pinnate, acute at the apex, and gradually diminished from about two-thirds of its length to the very base, the lower pinnæ being so remarkably short, that this character alone is sufficient to distinguish it from all our other ferns. There is but a very small portion of the rachis bare, and this is covered with scales. The pinnæ are linear, and acute at the apex, rather distant, deeply pinnatifid,

and attached to the rachis only by their stalk. The pinnulæ are rounded, and slightly crenate. Over the whole of the under surface are scattered small yellowish glandular globules, which are adhesive to the touch, and emit a powerful, but not very agreeable odour. It is probably in consequence of this property that this species has so frequently been mistaken for the Polypodium fragrans of Linneus, a plant which I consider perfectly distinct, and one which has not yet been discovered in any part of the United Kingdom.

The veins in the pinnulæ of Oreopteris are a simple alternate series: they cease just before reaching the margin, first bearing a circular and nearly naked mass of thecæ; sometimes, however, the veins divide just before their extremity, and then each branch usually bears a separate mass. The masses, varying on each side from five to ten in number, form a regular and nearly marginal series. In some instances, but very rarely, a small torn white indusium is to be seen near the centre of each mass of thecæ (see the figure at page 47). This indusium is said to be reniform—in other words, attached on one side, a character I have never yet been able to detect. In general, the masses are perfectly naked, even before the frond has unrolled, and the plant presents every appearance of being a true Polypodium.

THE MALE FERN.

LASTRÆA FILIX-MAS.—Presl.
Aspidium Filix-mas.—Smith, Hooker, Galpine, Mackay, Francis.
Polypodium Filix-mas.—Linneus, Berkenhout, Hudson, Bolton, Withering, Lightfoot.
Aspidium nemorale.—Gray.

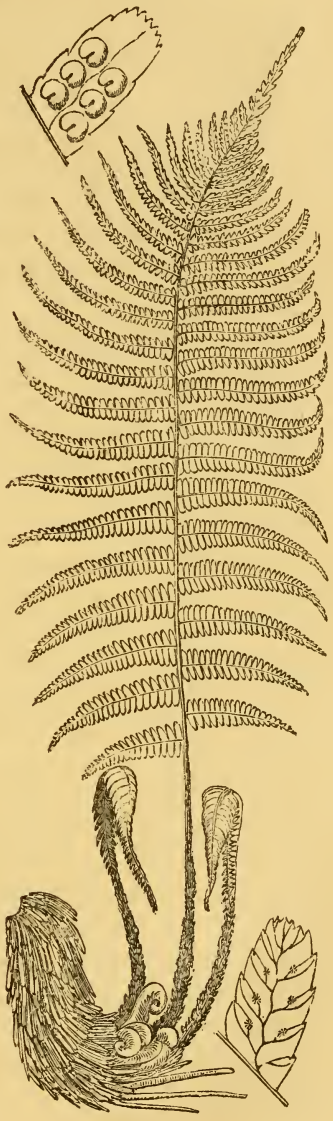
LOCALITIES.

ENGLAND.
WALES.
SCOTLAND.
IRELAND
} Universally distributed.

THIS is a most abundant species, and one which seems to delight in wooded and well-cultivated districts; although scattered over every part of the kingdom, it is ever most luxuriant in rich soil and shady situations: it lives to a great age, and the fronds of each succeeding year increase in size.

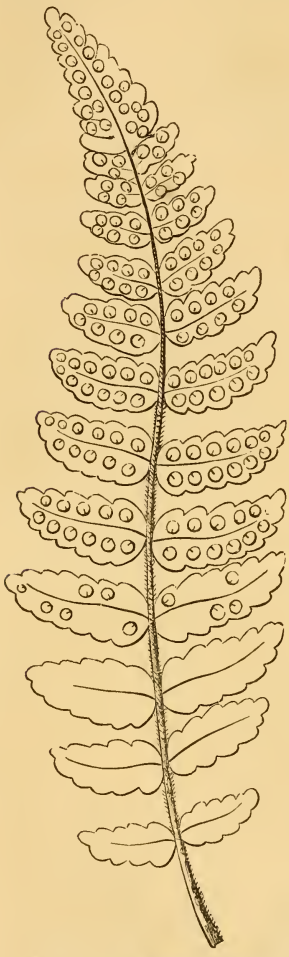
The roots are extremely strong and tough, they are of a dark brown colour, and penetrate very deeply into the earth; the rhizoma is tufted: if in a favourable situation, it elongates slightly every year, so that in very old plants it makes a decided appearance above ground, and the crown of the rhizoma, whence spring the fronds, appears to be seated on a short stem; it more often, however, assumes a pendant position, as represented in the next page, the crown of the rhizoma curving at the extremity, and the fronds growing in a nearly erect position. This elongation of the rhizoma in Filix-mas, (a character still more decided in Filix-femina,) affords us a clew to that erect and elongated part which is called the "trunk" of Tree Ferns. It is inconsistent with analogy to suppose that genera, which are so obviously allied in every other character, should be so totally different in this, as for one to possess a trunk, and the other to be entirely without it.

The fronds make their appearance in May: at first they are perfectly circinate, but after a few days the apex of each is liberated, and hangs down, the frond at this period possessing the bend which characterises a shepherd's crook, as represented in the illustration. In this state it is very tender, and is generally cut down by the late frosts of spring; the loss is, however, quickly supplied; a second series of fronds make their appearance, and expanding at a more congenial time, arrive in safety at maturity. The fronds are mature in August, and last to the middle of winter quite uninjured. They are generally fertile, but plants are not of unfrequent occurrence which produce only barren fronds; and these are generally larger, greener, and have the pinnulæ more deeply serrated than when fertile: the fronds vary from five to ten or more in number, their position is nearly erect, or, perhaps, somewhat slanting, and radiating from a common centre. The length of the fronds averages between two and three feet, and the rachis is naked nearly one-third of its length, and very chaffy.



The form of the frond is lanceolate and pinnate; the lower pinnæ are considerably shorter than those of the middle of the frond, but never approach the diminutive size of those of Oreopteris: the pinnulæ are nearly linear, but acute at the apex; they are regularly pinnate; the pinnulæ are obtuse, somewhat pinnate at the extremities, and serrated at their margins.

The lateral veins are forked about half way between the midvein and margin: after the fork the anterior branch bears a nearly circular mass of thecæ, which are covered by a smooth, lead-coloured indusium, reniform, or attached to the vein at the point where the stalks of the thecæ are inserted; the indusium is more perfect, conspicuous, and lasting than in any other British fern; the veins do not quite reach the margin of the pinnulæ, and the anterior is not quite so long as the posterior.



Although this fern is of very constant figure, yet it occasionally departs a good deal from the typical form; a frond preserved in the herbarium of Mr. Winch, now in the possession of the Linnean Society, is simply pinnate, the margins of the pinnæ being waved, but not divided. This variety is precisely analogous to the lonchitiform variety of Polystichum aculeatum; it is not a seedling, or young plant, being itself in full fructification, as shewn in the accompanying figure. Three other varieties are named by Mr. Francis, viz., 1. Variegatum. White-tipped, and edged with green. 2. Recurvum. Pinnæ crisped, turned down; frond small, rachis smooth. 3. Spinosum. Pinnules serrate, smaller blended together, larger auricled.

Much has been said of the value of the rhizoma of Filix-mas as a vermifuge, and formerly it was employed in this capacity somewhat extensively: the result of my inquiries on the subject is, that it has long ceased to be an article of any commercial importance.

THE CRESTED FERN.

LASTRÆA CRISTATA.—Presl.
Aspidium cristatum.—Smith, Hooker, Galpine, Gray, Francis, (not of Mackay.)
Polypodium cristatum.—Linneus, (not of Berkenhout, Lightfoot, nor Hudson.)

LOCALITIES.

ENGLAND. . Nottinghamshire, Oxton-bogs, near Nottingham; Norfolk, among furze at Holt heath, and by the side of a drain on Fritton-broad.
WALES. SCOTLAND. IRELAND. } Unknown.

ALTHOUGH Lastræa cristata has occurred so very sparingly in this country, it is not difficult to form an opinion of its value as a species: our English plant corresponds precisely with the Polypodium cristatum of Linneus, as now preserved in the Linnean Herbarium. There is scarcely a species which has remained during a series of years so completely local. The fronds, said by Smith to have been gathered on bogs amongst alder bushes, at Westleton, Suffolk, by Mr. Davy, I have never seen; and I fear that some mistake has, in this instance, crept in, either as to the plant, or the habitat. Mr. Smith, of Kew, has a frond labelled Leicestershire, but I believe nothing more is known on the subject, so that I fear to record that county as an undoubted habitat of the species. I am indebted to Mr. Samuel Woodward for the loan of specimens gathered by Mr. Wigham, on Fritton-broad, Norfolk, a habitat which I think has not been previously recorded; and those from Holt-heath and Oxton-bogs I have also seen and carefully compared.

The root of Lastræa cristata is brown, short, and not firmly fixed in the earth; the rhizoma is tufted and rather chaffy: the

fronds are few in number, they rise early in spring, and disappear before winter. The figure of the frond is linear, its position remarkably erect, and much more than a third of the rachis is naked: towards the base it has a few scattered chaffy scales. A remarkable character of this species is the propensity of the frond to decay and turn brown in spots; this is more particularly observable towards the apex of the frond and pinnæ. The fronds are pinnate; the pinnæ, which are attached by their stalks only, are distant, very short, nearly triangular, and pinnatifid, the pinnulæ being serrated. The fronds are fertile and barren, the former are nearly twice the length of the latter.

The lateral veins in the pinnulæ are many-branched, and the anterior branch bears a circular mass of thecæ, about half-way between the midvein and margin. The masses are covered by an indusium, which often remains *in situ* after the seeds are fully ripe: it is reniform or attached at a lateral point, which, as the indusium shrivels, and the thecæ swell, is forced into the centre of them, and so appears to be orbicular, and attached centrally, as in the genus Polystichum. Sir J. E. Smith does not seem to have been aware of this structure, or of the importance of observing the characters of the indusium; his description of the indusium of cristata would make it a Polystichum, while Lonchitis, "with a notch on one side," would become a Lastræa. This carelessness is more particularly to be regretted, because compilers unhesitatingly copy, and thus perpetuate, these errors.

Mr. Beevis tells me that he found this rare fern near the windmill, on Wimbledon Common: if this be the case, I am inclined to think it must have been planted there. Many botanists have industriously sought for it in this locality, but in vain.

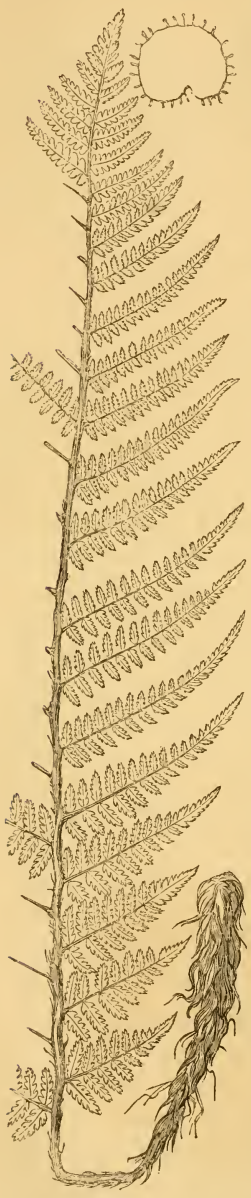
THE RIGID FERN.

LASTRÆA RIGIDA.—Presl.
Nephrodium rigidum.—Don.
Aspidium rigidum.—Schkuhr, Hooker, Francis.

LOCALITIES.

ENGLAND . . Yorkshire, foot of Ingleborough, rocks near Settle.
WALES. IRELAND. SCOTLAND. } Unknown.

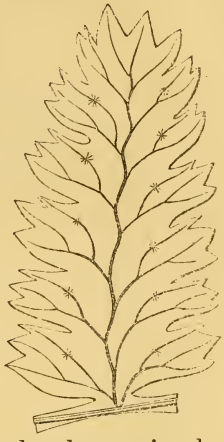
THIS is another species unknown in this country, except in the two habitats above recorded. As far as I am able to judge, the Settle plant agrees exactly with the figure given by Schkuhr in his Kryptogamische Gewächse, Pl. 38, and, unwilling as I am to admit continental species on the mere coincidence of form in a casual frond, I must acknowledge that the specimens of rigidum gathered near Settle by Mr. Tatham, and obligingly presented to me for this work by Mr. D. Cooper, appear to be, beyond a doubt, the species in question. The Rev. Mr. Bree has kindly transmitted to me specimens of his plant, gathered in 1815 on Ingleborough, near the foot of the mountain, towards the neighbouring village; when cultivated, it assumes a more diffuse and lax appearance, and is not so like Schkuhr's figure as the plant from Settle. I have the weighty authority of Professor Don to support me in the opinion that this species is identical with the Aspidium rigidum of Schkuhr. This plant was first mentioned as a British species by Dr. Hooker, in the Supplement to the English Botany, Pl. 2724, under the name of Aspidium rigidum; it was next published by Professor Don, in the Transactions of the Linnean Society of London, Vol. xvii. p. 435, as Nephrodium rigidum; and, lastly, by Mr. Francis, in his "Analysis," p. 33, and figured Pl. ii. fig. 10: the figure, which, as a drawing, is very elegant, appears rather to be a representation of Filix-mas than the present species.



Previously, however, to the description in the English Botany, by Hooker, assigning to this fern the rank of a species, the same author had noticed it as a variety in his British Flora, 1st edition, p. 412, where it stands as Aspidium spinulosum, var. γ. In the Herbarium of the late Sir J. E. Smith, are two fronds from Davall's Herbarium, which are thus labelled in Smith's hand-writing, "As. rigidum. Willd. Sp. Pl. Vol. v. p. 265." As I think it probable that, with the view of testing my accuracy by the weightier authority of Smith, these fronds may hereafter be examined by those botanists who take an interest in establishing the identity of species, it seems needful to say that those fronds do not appear to me identical with Willdenow's description or Schkuhr's figure, and certainly not with the British fern I am now describing. One of the fronds in question is from Dauphiny, the other from Switzerland, neither therefore having any claim to be ranked as British. I conceive it my duty simply to point out, without venturing to rectify, the error.

The roots are long, and the rhizoma large and tufted. The rachis is unusually thick at the base, and very thickly clothed with chaffy scales, which are more or less abundant throughout its entire length. The naked part of the rachis is about one-fourth of its entire length. The frond is nearly erect, and its habit is altogether a good deal that of Lastræa Filix-mas: it is lanceolate and pinnate; the pinnæ are crowded, and often from twenty to thirty in number on each side; the lower ones are wider at the base, shorter and more triangular than those in the middle and upper part of the frond; they are all pinnate; the pinnulæ are somewhat stalked, and so deeply divided into lobes that they would

almost be called pinnatifid; the lobes are serrated, the teeth *being without spines.* This character I consider of importance, as removing all doubt as to this species ever sinking into a variety of Lastræa dilatata.



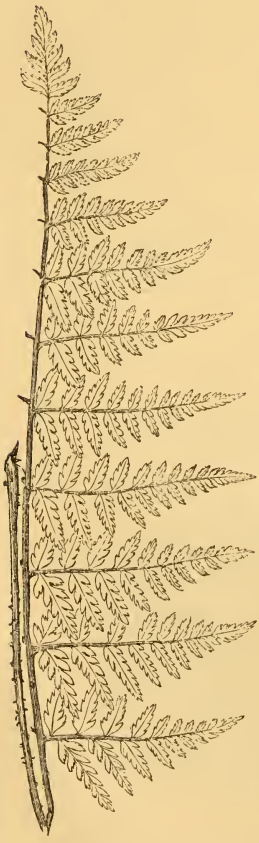
The midvein of the pinnulæ is waved; the lateral ones are alternate, and each is forked almost immediately after leaving the midvein: the posterior branch is again divided, and ramifies into each serrature of the lobe: the anterior branch bears a circular mass of thecæ, and these masses, ten or twelve in number, are closely packed, becoming completely confluent; each of the masses is covered by a reniform lead-coloured indusium, which is attached to the vein by a short stalk placed in the lateral notch. The figure in the margin shows the veins, and the points of the attachment of the thecæ; in the figure at page 55 I have shown the masses of thecæ and their indusia in the natural situation.

The indusium of this fern is furnished with a fringe of stalked glands, as represented at the top of the cut in the preceding page.

(See p. XXXVI)

BROAD FERN.

LASTRÆA DILATATA.—Presl.
Aspidium dilatatum, spinulosum, and *dumetorum.*—Smith.
Aspidium dilatatum and *spinulosum.*—Galpine, Gray, Francis.
Aspidium spinulosum and *dumetorum.*—Hooker, Mackay.
Polypodium cristatum.—Hudson, Bolton, Lightfoot, Withering, Berkenhout.



LOCALITIES.

ENGLAND. WALES. SCOTLAND. IRELAND. } Universally distributed.

AN error appears to have crept into our works as regards this ubiquitous species. Hooker and Mackay have assigned to it the name *spinulosa*, and Smith, Galpine, and others, have restricted the same name to one of its varieties. Now I must express my conviction that the spinulosa of the continent, as described by Willdenow, Swartz, Sadler, Schkuhr, &c., and as figured by the latter author, is not the normal dilatata of this country, neither is it that linear, erect form of dilatata figured in the margin, and to which the name has usually been applied; but is a perfectly distinct species, and one which may at once be distinguished from any form of dilatata by the indusium, which, in spinulosa, is covered with glandulose spines or bristles, while in dilatata it is perfectly smooth.

Lastræa spinulosa is so abundant on the continent of Europe, that it is perfectly reasonable to expect to find it here; but we must not

apply its name to a plant, which, whether a species or variety, does not possess its distinguishing character.

The figure above represents the normal or triangular form. The root is black, fibrous, and very tenacious, and growing, as is frequently the case, on decayed trees, or on the stumps in hedge-rows, it is extremely difficult to get out entire; on rocks, and among stones, it adheres with a similar tenacity; but in woods and forests, where it frequently abounds among the dead leaves, it can find no substance to which to attach itself, and is consequently removed with the greatest ease. The rhizoma is large, tufted, black, and very scaly. The fronds appear in March, and, although so early, are rarely injured by the frost; new fronds succeed throughout the summer: they all appear to attain maturity in September, and continue perfectly green and vigorous throughout the winter. All the fronds are fertile, or, if otherwise, there is no perceptible difference in their characters.

The normal form of the frond is triangular, and, however it may vary, we always find it has the lower pinnæ very ample, sometimes, indeed, not larger than the second or third pair, but never abbreviated or diminished, as we see it in the other species of this genus. Rather less than half the rachis is usually naked, and this has invariably black chaffy scales scattered more or less abundantly throughout its length: it is very large at the base, a character preeminently distinguishing this species. The frond is pinnate; the pinnæ are also pinnate, and the pinnulæ are either pinnatifid or pinnate, and the first lower pinnula of each pinna is invariably larger, longer, and more divided than the rest; all the divisions or serratures of the frond end in a short spine. The size is extremely various; I have frequently seen fronds three feet in length, and as frequently observed them less than six inches.

Much confusion exists as to the variety to which Sir J. E. Smith has given the name dumetorum. The upper figure in this page represents the plant to which the name is usually applied; it is dwarf, rigid, *convex* in every part, and usually of a very dark green colour, sometimes inclining to brown; the masses of thecæ are nearly black. It occurs in abundance on the boggy and mountainous districts of Scotland and Ireland, and I have seen it, although more sparingly, in North Wales. Its character does not vary perceptibly in cultivation. The fronds labelled *dumetorum* in the Smithian Herbarium appear to me to belong to this plant, but they are evidently blighted, or otherwise deformed, and hence it is very difficult to identify them.

It fortunately happens that the identical plants which Sir J. E. Smith described, and to which he alludes in the English Flora, as raised from seed, are at present in existence; they are in the Botanic Garden of Liverpool, and are similar to the lower figure in this page; the colour is a light and bright green; the form is triangular, the size diminutive, and all parts of the frond, the pinnæ, pinnulæ, and the lobes or divisions of the pinnulæ, are *concave*. I have seen the plants in question, labelled correctly, but not having met with Mr. Sheppard, the curator of the garden, I was not aware they were authentic, and am indebted to Mr. Moore for the information that they are the identical specimens described by Smith.

In the fourth volume of the Magazine of Natural History, page 162, we have the same plant described and figured by the Rev. W. T. Bree, under the name Aspidium dilatatum recurvum. The wood-cut has been most obligingly lent me by Mr. Loudon, and is republished in the following page.

In the neighbourhood of waterfalls, and other damp situations, the plant becomes more elongate and luxuriant, and is then the Aspidium dilatatum concavum of Babington, a name, by the way, of great excellence, and highly expressive of the peculiar character of the plant.

The types of form of this fern may be considered as four.

1. The *linear* type: erect, rigid, pale sickly green, lateral margin of the frond nearly linear, figured at page 58, and the spinulosa of London Herbaria: it is sometimes much narrower, and the pinnæ point more upwards than in the figure.

2. The *dwarf* type: dwarf, nearly erect, rigid, dark green or brown, lateral margins nearly linear, all the divisions having a tendency to become convex above; figured at page 60 (the upper figure); this is the dumetorum of London Herbaria.

3. The triangular type: drooping, deep full green; broadly triangular, the divisions having a tendency to become convex above; figured at page 59: this is the dilatata of London Herbaria.—*Note.* It is extremely easy to find a complete series of intermediate fronds connecting these three types of form.

4. The concave type: when luxuriant, drooping; when starved, more erect: triangular, bright beautiful green, all the divisions concave above; figured at page 60 (the lower figure): this is the dumetorum of Smith and Mackay; the recurvum of Bree (concavum of Babington), which I consider identical, is figured opposite.

In every variety of this species, the lateral veins are placed alternately on the midvein, after leaving which, each sends out an anterior branch, which bears a nearly circular mass of thecæ half-way between its origin and extremity; all the veins terminate before reaching the margin: the masses are covered by a loose reniform indusium, which is attached on one side; it is soon lost among the growing thecæ.

LADY FERN.

ATHYRIUM FILIX-FEMINA.—Roth, Presl.
Athyrium irriguum, and *lætum*.—Gray.
Asplenium Filix-femina.—Bernhardi, Hooker, Mackay, Don, Francis,
Aspidium Filix-femina and *irriguum*.—Smith.
Polypodium Filix-femina and *rhæticum*.—Linneus, Hudson, Berkenhout.
Polypodium Filix-femina.—Lightfoot, Bolton, Withering.

LOCALITIES.

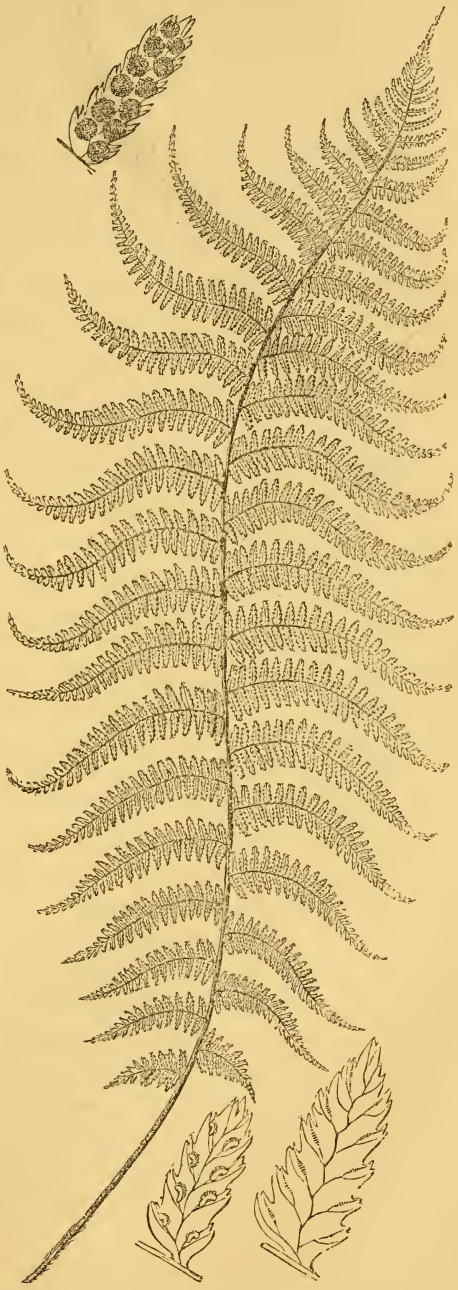
ENGLAND. WALES. SCOTLAND. IRELAND. } Universally, but not equally distributed.

THE name Lady Fern, long since given to this species, is eminently expressive of its graceful appearance. The great Ray applied the term femina to our common brakes, but I think that Linneus has done well in transferring it to the present delicate and lady-like species. It is so fragile, that it droops instantly on being gathered.

In opposition to the views of many eminent botanists, I feel inclined to return the Lady Fern to the genus Athyrium of Roth, which I think must also include the Allantodia australis of Brown. But I doubt whether I can agree with Presl in placing Asplenium Halleri, and A. fontanum in the same group. Besides Allantodia australis of Brown, there are several ferns possessing the same characters and habits as filix-femina, which I would also include: the genus may be known by the elongate and somewhat sausage-shaped mass of thecæ, the attachment of which describes a concave, instead of a direct line, as in the Asplenia. A. australis differs from filix-femina in having the free margin of the indusium more obviously incurved over the mass of thecæ.

The root is black, fibrous, and wiry. The rhizoma is vertically

elongate, sometimes rising several inches above the surface of the ground: in one instance I have seen it more than a foot in height, thus evincing a considerable proximity to the Dicksoniæ, and other tree-ferns. Mr. Ball, of Dublin, called my attention to a plant in one of Mr. Ward's cases, in which this peculiarity was very remarkable. The fronds appear in May; in vernation they resemble those of filix-mas, having the apex bent downwards after the fashion of a shepherd's crook.

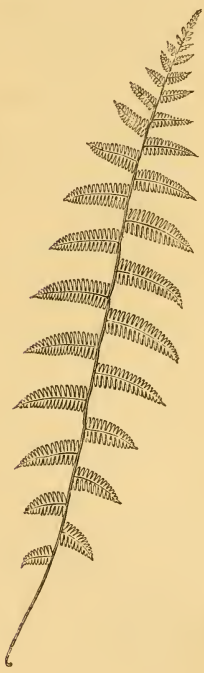


The form of frond is somewhat lanceolate: it is pinnate; the pinnæ are linear, more or less crowded, acute at the apex, and regularly pinnate: the pinnulæ are distant, very distinct, and either deeply serrated, pinnatifid, or pinnate. One-fourth of the rachis is naked, but has numerous black scales.

The midvein of the pinnulæ is waved; the lateral veins are forked shortly after leaving the midvein, and the anterior branch of each bears, about half-way between the midvein and margin, an elongate, somewhat reniform mass of thecæ, which is partially covered by an indusium

attached on the concave side of the mass. The detached pinnula on the left hand at the bottom of the cut shows the veins, with the masses and their indusia *in situ ;* that on the right hand shows only the veins and the attachments of the thecæ. In approaching maturity the indusia are forced aside and ultimately lost, the masses becoming circular, as represented in the detached pinnula at the top of the cut, and often indeed confluent, covering the entire under-surface of the pinnula.

Professor Don, in the Transactions of the Linnean Society, Vol. xvii. p. 436, observes, that "there are two very marked varieties of this plant, the one with broader segments of a dark green, and with the rachis of a pale purple hue; the other, and that the commonest, with the segments of a more delicate texture, and the whole frond of a pale green. The latter variety varies much in size, according to soil and situation; in damp, shady places, it becomes the Filix-femina of English Botany, and in more open exposed situations, the irriguum; but neither of these states is entitled to be regarded as a distinct form." In these remarks, Professor Don has omitted to mention a character which I think of still more importance; the variety, of which "the segments are of a more delicate texture," has the margins of each pinnula folded together, and so convolute as nearly to meet below, which character causes each pinnula to look very narrow from above: the pinnulæ of the other variety are spread out and flat; the serratures or lobes being perfectly displayed. The Aspidium irriguum of Smith is a variety of the convolute form; it is not one of those types of form which in P. aculeatum, L. dilatata, &c. are constant in their peculiarity through a whole series of plants: the characters given by Smith of "small size," "more lanceolate figure," "main stalk occasionally scaly and exactly quadrangular," "leaflets shorter, less linear, deeply serrated, or partly pinnatifid," may correctly describe one frond, or one plant, but they are not characters by which to distinguish any type of form or series of plants; and the name irriguum being



founded on these characters, cannot, with propriety, be retained even as a variety, because, should it hereafter be proved that we possess two or more species of Athyrium in this country, we shall inevitably find the above characters applying occasionally to a frond or plant of every species, and thus we shall have varieties of more than one species named irriguum.

Filix-femina may be said to possess two distinct types of form, which, although they may occasionally approach, yet, in ninety-nine plants out of every hundred, in a recent state, may be distinguished at a single glance : they may be thus characterised :—

1. Flattened type: the fronds are broad, drooping, heavy, and often of very large size, three, four, and five feet in length : the pinnulæ are perfectly flat, and all their cuttings are clearly displayed, and the masses of thecæ seldom, perhaps never, become perfectly confluent : the plants of this type vary infinitely in the cutting of the pinnulæ, also in the colour of the rachis, which is green, or inclining to red, purple, or even brown; this form is figured at page 63, and is the Polypodium rhæticum of Linneus.

2. Convex type: the fronds are narrower, rigid, erect, light, feathery, and of smaller size, but still occasionally reaching two feet to thirty inches in height: the pinnulæ are convex, the margins always being bent downwards, the masses crowded and confluent: the rachis is somewhat pellucid, and very brittle ; it is generally pale green, sometimes nearly white, sometimes of a pink tinge, and sometimes almost as red as coral: this form is figured at page 64, and is the P. Filix-femina of Linneus.

SPEAR-SHAPED SPLEENWORT.

Asplenium lanceolatum of Authors.

LOCALITIES.

England.... Kent, among ivy, on the face of a rock near the High Rocks, and also on the High Rocks, Tunbridge Wells, Devonshire, Morwell Rocks on the banks of the Tamar, rocks on the banks of the Tavey opposite Virtuous Lady Mine, rocks near Cann quarry on the banks of the Plym; Cornwall, near St. Ives, and various other localities, also the Scilly islands.

Wales..... Merionethshire, near Barmouth, on rocks and walls; Caernarvonshire, on a rock to the left of the road between Tan-y-bwlch and Aberglaslyn, and on a second rock close to Aberglaslyn.

Scotland. } Unknown.
Ireland. }

This is one of our most local ferns; it is confined, as far as I am aware, to the coasts of Merionethshire, Caernarvonshire, Devonshire, and Cornwall, and to the neighbourhood of Tunbridge Wells, where, I am sorry to say, "owing to the ravages of unprincipled botanists," it has become nearly extinct. In Scotland and Ireland it is at present entirely unknown. It roots in the fissures of rocks, and seems to require no depth of earth: in one instance in the neighbourhood of Barmouth, I have found it in profusion on an old stone wall. Whenever I have met with this fern, it has been intermixed with its cognate species,

A. adiantum nigrum, which, in some of its numerous varieties, it nearly resembles.

The root is black, very long, slender, and penetrating; in the fissures of rocks it runs to a great depth; the rhizoma is brown, tufted, and densely covered with bristle-like scales; the young fronds appear in May, arrive at maturity in August, and last uninjured throughout the winter: they are always fertile.

The form of the frond is various; in some situations it is of erect growth, nearly linear, and simply pinnate; the pinnæ being stalked and lobed: in this form it produces seed most abundantly, and the masses, when fully grown, are perfectly circular: of the three entire fronds represented in the illustration (see the preceding page), the one to the right is intended for this variety, and the portions of fronds to the extreme right and left show the situation of the veins, and mode of fructification: every part of the frond is perfectly flat, and the entire plant rigid. A second variety, of pendant growth, and larger size, is lanceolate in form; the pinnæ are pinnate, the pinnulæ stalked, serrated, and somewhat quadrate; the fronds often reach a foot in length; they usually issue from dark holes or shaded spots, and the lower pair of pinnæ are often weak, bleached, and of small size; the surface of the frond is generally flat, although sometimes slightly inclined to concavity, and when this is the case, each pinnula partakes more or less of the character: the middle frond of the three represents this variety, and the detached pinnula immediately adjoining it shows the veins and incipient indusia. A third variety is of nearly erect growth, but bends over at the extremity, and the entire frond, together with each individual pinnula, possesses such a rigid and inflexible convexity, that it is next to impossible to flatten the plant by pressure: the frond to the left is intended to represent this form, but the convexity is not expressed.

The lateral veins are branched, a branch running to the extremity of each serrature: the masses of thecæ are attached *near thê extremity* of the veins, and somewhat alternately, one branch bearing a mass, and the next being without one: each mass is at first elongate and linear, and covered by a linear white indusium; the indusium afterwards disappears, and the mass becomes nearly circular.

BLACK SPLEENWORT.

ASPLENIUM ADIANTUM-NIGRUM of Authors.
Asplenium lucidum.—Gray.

LOCALITIES.

ENGLAND.
WALES.
SCOTLAND.
IRELAND.
} Universally distributed.

THE Black Spleenwort is more or less abundant in all our counties: its natural habitat, like that of A. lanceolatum, appears to be the fissures of barren and exposed rocks, but in these situations it never attains the size or luxuriance which it so constantly exhibits when growing on our walls, on ruins, or in our hedgerows.

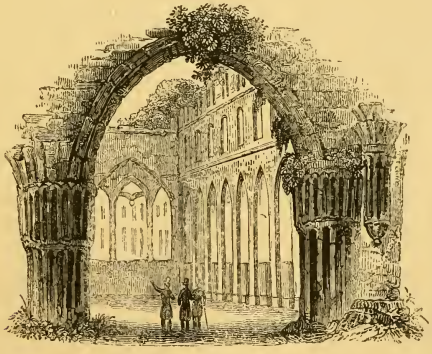
The root is very black and wiry; the rhizoma tufted, black, and covered with bristly scales; the rachis is extremely smooth and shining, having a few scattered scales at its base; one-third of its entire length is naked, and this portion is usually black, or dark purple. The fronds seldom appear before the end of May or beginning of June; at first their position is nearly erect, but

they soon begin to droop, and finally become quite pendulous: they arrive at maturity in September, and continue perfectly green and vigorous throughout the winter, and until the ensuing May or even June: they are always fertile.

The form of the frond is triangular, the apex being acute and attenuated; it is pinnate: the pinnæ are triangular, acutely pointed, pinnate and alternate; the pinnulæ again are alternate and triangular, and the lower ones pinnate or pinnatifid, with their lobes notched: the fronds represented are of the natural size, but are drawn from fronds which may be less than the average.

The lateral veins in the pinnulæ or lobes, as the case may be, are irregularly alternate, and generally forked after leaving the midvein, and one or both branches of this divided vein bears an elongate linear mass of thecæ; these masses are always situated near the midvein, and at first are completely covered by a long, narrow, white, scale-like indusium, which opens towards the midvein, and as the thecæ swell and approach maturity, it is raised, pushed from its site, turned aside, and finally entirely disappears, and the under-surface of the frond becomes a continuous mass of rich brown seed.

The superior length of the lower pinnæ, and the oblique angle at which these, and indeed all the pinnæ, are attached to the rachis, and, lastly, the more central situation in the pinnulæ occupied by the thecæ, are characters by which this species may be readily distinguished from the preceding.



RUE-LEAVED SPLEENWORT.

ASPLENIUM RUTA-MURARIA of Authors.
Asplenium murale.—Gray.
Asplenium germanicum.—Willdenow.
Asplenium alternifolium.—Wulfen, Smith, Francis. } *Var.* β.

LOCALITIES.

ENGLAND. WALES. SCOTLAND. IRELAND. } Universally distributed.

THE Wall Rue, or Rue-leaved Spleenwort, is one of those plants, which, like our half-domesticated birds, the sparrow, the swallow, and the martin, seem to have deserted their native wilds, and to have taken up their residence amongst the habitations of men. It is abundant on ruins and on old churches, walls, and bridges, and this equally whether they be built of brick or stone; although Ray * asserts, and subsequent authors have repeated, that when it gets upon burnt bricks, it dies: this misstatement must, I think, have arisen in the first instance from a slip of the pen, or, perhaps, a misprint, and not from a hasty or incorrect observation; for so carefully observant a man as Ray must have frequently seen it flourishing in the crumbling mortar, filling the interstices of brick buildings: we need wander no further from London than the wall of Greenwich Park, and here it will be found abundantly on the brick, but very rarely on the stone. Throughout the northern, western, and southern counties of England, and also in Wales, Scotland, and Ireland, this fern is to be found on almost every ruin. In a perfectly wild state, it grows abundantly on the rocky hills in Scotland, particularly on Arthur's Seat, near Edinburgh; in the Peak district of Derbyshire; on Cader Idris, and Snowdon sparingly.

The roots of Asplenium ruta-muraria are wiry and black; the rhizoma is black, tufted, and clothed with bristly scales: the fronds make their appearance in May and June, arrive at maturity in September, and continue perfectly green throughout the winter, and until the ensuing May: they are always fertile.

* The assertion is only in the 3d Edition, edited by Dillenius.

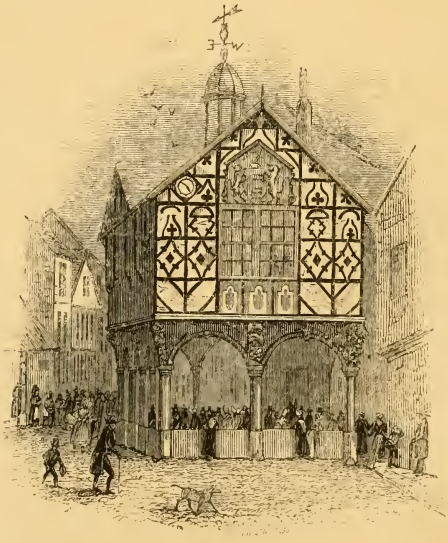
The rachis is black, or dark purple, very smooth and shining and for more than half its length, naked. The normal form of the frond is triangular and pinnate, the pinnæ being alternate, and also pinnate; the pinnulæ are of varied form, but mostly somewhat triangular or lozenge-shaped; their exterior margin is generally serrated.

The veins radiate from the stalk to the exterior margin of the pinnula, and to these are attached the elongate linear masses of thecæ, two, three, four, and even five on each pinnula; these are at first covered by an elongate, linear, white indusium, which is pushed aside by the growing thecæ, turned back, and finally lost, the back of the pinnula becoming eventually covered by a dense brown mass of thecæ.

A very remarkable form of this plant has been found in several localities in Germany, Hungary, and Scotland; by many botanists this has been considered a species, under the name of Asplenium germanicum, or A. alternifolium. A representation of this plant, which I would propose to name the *alternate type* of A. ruta-muraria, is given at ββ: the form of the frond is elongate and pinnate; the pinnæ are distant, small, linear, alternate, and generally notched or divided at the apex. Above the two singular plants ββ I have figured a third, with three dissimilar fronds; this was gathered at Arthur's Seat, near Edinburgh, in 1838. I have introduced this, as forming a connecting link between the normal type of the plant represented above and the alternate type below; and I think

if a botanist were to commence with the seedling form at the top of the cut, and go regularly downwards, he would find it difficult to divide the plants represented into two distinct species. Still, as botanists of eminence have considered this plant as specifically distinct, I have much pleasure in being able to quote the opinion of Linneus as corroborative of my own. The passage I quote is from the pen of M. Jacquin, and stands in his "Miscellanea Austriaca," appended as a note to a paper by Wulfen, entitled, "Plantæ rariores Carinthiacæ." Jacquin, in alluding to A. alternifolium, there described by Wulfen, writes thus:—"Plantulam hanc jam olim crescentem in Austria, circa Glocknitz in rupibus calcareis etiam mixtim cum Acrosticho septentrionali. Cum beatus Linneus quocum communicaverim, *mordicus sustineret mecum esse Rutæ murariæ varietatem*, non ausus fui pro novâ specie proponere et omiseram in stirpium agri Viennensis enumeratione."—Jacquin Mis. Aus. Vol. ii. p. 52, anno 1781.

Sir J. E. Smith remarks, that this plant is "an intermediate species between septentrionale and ruta-muraria, though perfectly distinct from both."



FORKED SPLEENWORT.

ASPLENIUM SEPTENTRIONALE.—Smith, Hooker, Galpine, Gray, Francis.

Acrostichum septentrionale.—Linneus, Bolton, Hudson, Lightfoot, Berkenhout.

LOCALITIES.

ENGLAND. . . . Northumberland, Kyloe craigs; Cumberland, Honiston craigs, and on rocks in the vicinity of Scaw Fell.

WALES . . . . . Caernarvonshire, Pwll Du in the Pass of Llanberris, and on Glyder Vawr, above Llyn-y-Coon very sparingly; a mile from Llanrwst, on the road to Conway, on a wall to the left, luxuriant.

SCOTLAND . . . Arthur's Seat and Braid hills, near Edinburgh, formerly abundant, now rare; Perthshire, near Dunkeld.

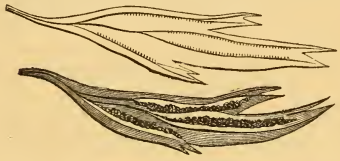
IRELAND . . . . Unknown.

THIS is one of our rarest ferns; for a number of years Arthur's Seat was the only locality where it could be obtained with anything like certainty. Mr. Wilson and Mr. C. C. Babington have recently gathered it in Caernarvonshire, although very sparingly, and in August, 1838, I had the good fortune to find it in luxuriant profusion on a wall by the road side going out of Llanrwst, towards Conway; the station is on the left hand, exactly opposite a farm-yard, and about a mile from Llanrwst. The plant is very obvious, and may be procured without difficulty; the stones in the wall are loose, so as to admit of their being readily removed and returned to their places. Although I have no hesitation in thus minutely recording this habitat of one of our very rarest ferns, I must accompany the record with a hope that botanists will exercise moderation should they

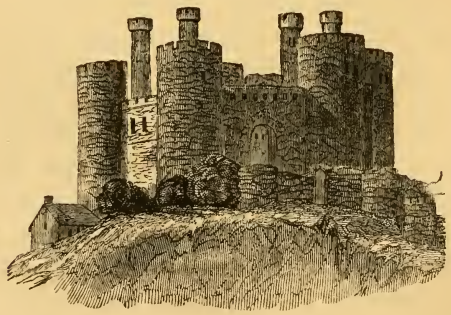
chance to visit the spot. If I hereafter revisit this wall, it will be mortifying to me to find that I have caused the destruction of the habitat.

The roots are very long, fibrous, crooked, and intertwined, and together with the rhizoma, which is very large and tufted, form an amazing bulk; a plant I procured at Llanrwst had upwards of three hundred fronds, and the mass of roots and rhizoma, after shaking off a good deal of earth, weighed several pounds. The fronds make their appearance in March and April, arrive at maturity in August, and remain green throughout the winter; they grow in a horizontal position from a perpendicular surface: the fronds represented in the preceding page are in the natural position, and of the natural size.

The form of the frond is elongate, lanceolate, and furnished laterally with one or two short bifid teeth or serratures, and the apex also terminates in a bifid point: it diminishes imperceptibly towards the base, and there terminates in a smooth rachis, which is black at the extreme base.



The veins are nearly simple, and few in number, one running into each serrature. The thecæ are attached to each vein in a continuous line, covered at first by an indusium of similar shape, which opens towards the mid-vein of the frond, and, as the thecæ swell, is thrown back, and finally lost, and the lower surface of the frond presents a continuous mass of thecæ.



SEA SPLEENWORT.

Asplenium Marinum of Authors.

LOCALITIES.

England. . . . Durham, near Berwick-on-Tweed; Sussex, near Hastings; Dorsetshire, near Lyme Regis; Cornwall, near the Loganstone, at Whitsand-bay, near Falmouth, Lizard Point, Scilly Islands, and St. Ives; Devonshire, Barnstaple Bay and Ilfracombe; Somersetshire, near Cleardon, in abundance on the rocks; Cheshire, entrance of the Dee, and Red Noses, near Liverpool; Lancashire, on the Mersey, near Warrington, and the Dingle near Liverpool; near Douglas, in the Isle of Man.

Wales . . . . . Caernarvonshire, Orme's Head; Anglesea, on the South Stack; Merionethshire, near Towyn; Cardiganshire, at Aberystwith, on the Castle rock, and on the Castle; Pembrokeshire, Fiskard Bay, St. David's Head, Ramsey Island, and on the coast exactly opposite; Glamorganshire, near Neath, Mumbles Lighthouse, between the Mumbles and Penyard castle, near Swansea, near Dunraven castle, Barry island.

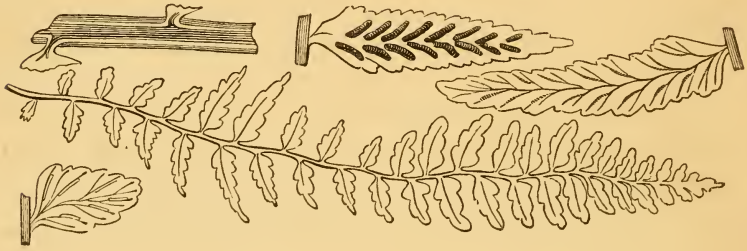
Scotland . . . Dumfriesshire, near Annan; Wigtownshire, near Portpatrick; Ayrshire, near Ayr; Isles of Bute and Arran; Argyleshire, near Oban; Isle of Mull: on the basaltic columns at Staffa; at Iona, almost covering the old cathedral; Rosshire; Invernesshire, on the Murray Firth; Aberdeenshire; Fifeshire, abundant at Weem's Cove; Inch Keith, in the Frith of Forth; Berwickshire, at Eymouth.

Ireland . . . . County Dublin, Isle of Lambay, Hill of Howth, Black Rock, Killiney bay; counties Wicklow, Wexford; County Cork, near Youghal; County Kerry, near Tralee, and at the Lakes of Killarney; County Clare, abundant on the west coast, between Louphead and Kilkee, and between Kilkee and Mohir Cliffs; County Galway; South isles of Arran and Cunnemara; County Mayo, Clew bay; Counties Donegal and Derry, on the coast; County Antrim, Giant's Causeway, Plaiskins, Carrick-a-Rede, Fairhead, Red Bay, Glenarm, Larne, Carrickfergus.

This fern is, as the name implies, essentially a marine species, rooting deeply in the fissures of cliffs, or clothing the roofs of sea-caves, in the darkest recesses of which it seems to luxuriate. Mr. H. Doubleday informs me that he found it completely

covering the roof of a large cavern at Petit Bot Bay, in the Island of Guernsey, and the specimens which he obtained there are of enormous size. Its growth is equally luxuriant in the islands of Madeira and Teneriffe, as I have been informed by the late Mr. W. Christy, whose ardour in botanical pursuits was only equalled by the kindness of his heart, and whose early loss will long be felt by a large circle of admiring friends. Did I need such an assistance to my memory, this fern would always remind me of him, for it was on the occasion of our last interview, that he described to me its beautiful growth in the island of Madeira, and offered me the fronds he had gathered there.

In Cornwall, A. marinum grows to a larger size than in our northern counties, and its form, as shown below, is more elongate and divided.



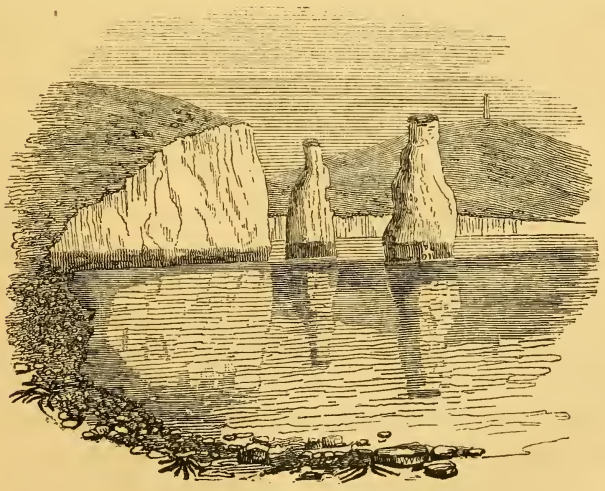
The figure in the preceding page is from a plant I gathered at Red Noses, near Liverpool, where I regret to say that the species has been nearly exterminated. In walking under Turk Mountain, on my way from Killarney towards Kenmare, I found this fern in considerable abundance to the left of the road, on a rock which appeared to have been blasted but a few years back. The largest plant I found was of the small size and unusual form represented in the annexed cut, which I thought worth giving as a record of this completely inland habitat. The plant grows at a considerable height on the cliff, and, except to a practised eye, would have much the appearance of Ceterach officinarum.

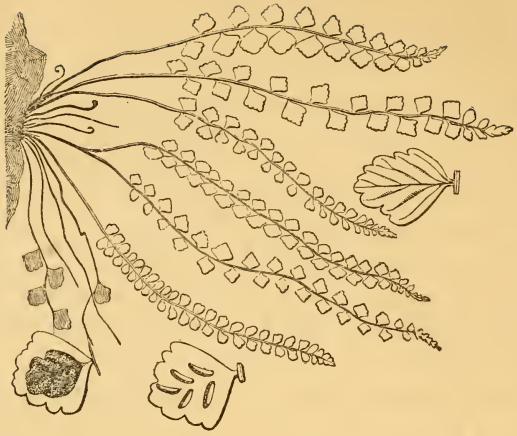
The root of A. marinum is black, wiry, tough, long, and so firmly fixed in the crevices of rock that it cannot be eradicated without the greatest difficulty: the rhizoma is nearly spherical, black, and covered with bristly scales: the fronds make their appearance in June and July, ripen their seed in October, and remain green throughout the year: in July and August fronds of successive seasons may be found equally vigorous.

The frond is linear, and simply pinnate: the pinnæ are stalked, ovate, and serrated; two larger ones frequently occur near the apex: the pinnæ are connected by a narrow wing running along the rachis, as shewn in the figure of the Cornish plant in the preceding page, the upper left hand figure representing a portion of the rachis.

The lateral veins are forked almost immediately after leaving the midvein; the anterior branch bears an elongate linear mass of rust-coloured thecæ, which, when young, is covered by a white membranous indusium of the same shape as the mass, and always opening towards the apex of the frond.

Adiantum trapeziforme of Hudson, Bolton, Berkenhout, &c. I believe to be nothing more than the Cornish form of this species.





GREEN SPLEENWORT.

ASPLENIUM VIRIDE of Authors.
Asplenium Trichomanes, β ramosum.—Linneus.

LOCALITIES.

ENGLAND . . Northumberland, Whitmitly; Yorkshire, Ais-la-beck, near Richmond, between Widdy Bank and Caldron Snout, Teesdale, Gordale in Craven, Ingleborough, Ogden Kirk near Halifax; Cumberland, plentiful on some rocks on the river Irthing, above Gilsland; Durham.

WALES . . . . Caernarvonshire, on Snowdon and all the Snowdon range, but in the fissure called Twll Du, and at the base of the fissure where it opens into Cwm Idwel, in the greatest profusion; Merionethshire, on Cader Idris; Brecknockshire, on Brecon Beacon; Glamorganshire, at the Lady's Waterfall, by Neath, and on rocks within a few miles of the same locality.

SCOTLAND . . On most of the loftier mountains, particularly those of the Western Highlands.

IRELAND . . County Sligo, on Ben Bulben.

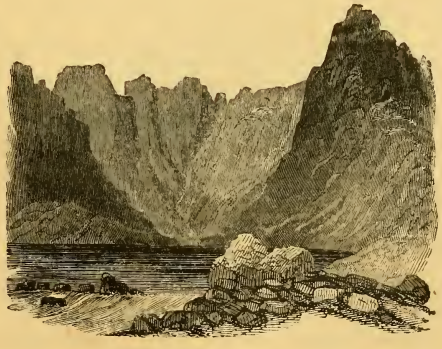
LINNEUS considered this fern a variety of the following, and assigned to it the name *ramosum*, in reference to a double frond similar to one represented in the figure above, a character which he justly considered as indicating only a variety; still this plant possesses characters peculiar to itself, and I quite agree with those authors who give the two plants as specifically distinct. It grows on rocks in lofty mountain regions, and is

usually intermixed with the almost ubiquitous Asplenium Trichomanes; in England, its geographical range is very limited, being confined to the extreme northern counties, and in Ireland, I believe, to a single mountain, Ben Bulben; but here, Mr. Moore informs me, it is abundant.

The root is fibrous, black, and rather tender; the rhizoma black, scaly, and tufted; the fronds appear in May and June, arrive at maturity in August, and remain green through the winter: they are fertile only.

The rachis is naked for about a third of its length: half the naked portion is black or purplish; the remainder to the apex of the frond, and all the pinnæ, are of a bright vivid green: the form of the frond is narrow, elongate, linear, and simply pinnate; the pinnæ are not so numerous as in A. Trichomanes; they are somewhat quadrate, but without angles, and more or less crenate at the margin: they are mostly placed alternately on the rachis, are usually very distinct, and separate, but sometimes crowded; they are attached to the rachis by their stalks only.

The lateral veins are either simple or forked; they bear an elongate linear mass of thecæ, almost immediately on leaving the midvein; and, if forked, the division takes place *beyond* the mass of thecæ; *this is the most decided specific character possessed by the plant:* the veins do not reach the margin of the pinna; the thecæ are at first covered by a linear, elongate indusium; this soon disappears, and they become confluent in a ferruginous mass, occupying the centre of the pinna, and concealing the midvein: the masses at first are four or six in number.



COMMON SPLEENWORT.

ASPLENIUM TRICHOMANES of Authors.
Asplenium Saxatile.—Gray.

LOCALITIES.

ENGLAND.
WALES.
SCOTLAND.
IRELAND
} Generally distributed.

THIS plant occurs so commonly in all parts of England, Wales, Scotland, and Ireland, that I did not consider myself justified in printing the alarming list of localities which I had prepared: it grows on rocks, walls, churches, bridges, ruins, and sometimes, but less frequently, on banks and in hedgerows. I once found it in the valley of the Wye, near the little town of Bualt, growing in such profusion on a bridge that it formed a continuous covering of green: there is scarcely anything in the vegetable world more beautiful than such a sight as this, and those only who have tried the experiment can say how readily such a sight may be realized by cultivation.

The roots are black, tough, and very insinuating, forcing their way into crevices of rock, that would have otherwise remained invisible; and certainly, in old buildings, promoting decay, by disintegrating the mortar, which, however enfeebled by time,

still adds in some degree to their strength and durability. The rhizoma is black, scaly, and tufted. The fronds make their appearance in May and June, arrive at maturity in August and September, and remain perfectly green throughout the winter; they are fertile only.

The rachis is naked for a third part of its length, smooth, shining, and black throughout; the form of the frond is narrow, linear, and simply pinnate: the pinnæ are dark green, and very numerous; irregularly ovate, obtuse at the apex, and more or less crenate at the margins; they are usually distinct and distant, but sometimes crowded, and each recumbent on the one preceding it; they are attached to the rachis by their stalks only, and when the frond approaches decay the pinnæ fall off like the leaves of phænogamous plants, leaving the rachis a bare denuded bristle: in size they vary from that of those represented in the fronds, to that of the detached pinnæ illustrating the fructification.

The lateral veins are forked soon after leaving the midvein, the anterior branch bears an elongate linear mass of thecæ, almost immediately after the fork: this mass is at first covered with an elongate, linear, white membranous indusium; as the thecæ swell this becomes obliterated, and the masses, which are black, become nearly confluent in two portions, which, however, very rarely unite over the midrib: the masses are ten or twelve in number.

The gothic windows of an old abbey afford many convenient crevices for this pretty fern; but the ferns sketched in the Vignette include the Hart's-tongue, and other species.

HART'S-TONGUE.

SCOLOPENDRIUM VULGARE.—Symons, Smith, Hooker, Mackay, Gray, Francis.

Scolopendrium officinarum.—Swartz, Willdenow.

Asplenium Scolopendrium.—Linneus, Bolton, Hudson, Lightfoot, Berkenhout.

LOCALITIES.

ENGLAND.
WALES.
SCOTLAND.
IRELAND.
} Universally distributed.

THE Hart's-Tongue is a particularly handsome and ornamental fern: its habit is well marked, and very decidedly different from every other British species. I believe it is universally, although not abundantly distributed: it so frequently grows in the thickest part of hedges that it may readily escape observation, and thus not appear so abundant as it really is. In Scotland I found it sparingly distributed, but I never passed a day without recognizing it in some few localities. In Ireland it is much more abundant; it is not only scattered generally over the island, but occurs in some localities in very great abundance, particularly in the neighbourhood of Sligo, and in the demesne of Muckruss, near Killarney; it here grows among the underwood, in the shrubberies, &c. in large luxuriant tufts, the fronds radiating from a common centre, and each being gracefully arched in a

semicircle, like the long feathers of a cock's tail. I have endeavoured to shew this form in the Vignette at page 93, and the ordinary pendulous character of the plant is shewn in the margin, and at page 1. The Hart's-Tongue is very commonly found on walls and ruins; and it seems particularly to delight in old wells, in which last situation its fronds sometimes grow to a very large size.

The roots are black, stout, and very long and strong: the rhizoma is tufted, blackish, scaly, and almost spherical: the young fronds make their appearance in April, growing in an erect position, the apex remaining circinate; by degrees they become horizontal, and at last pendulous; they arrive at maturity by the end of September, and continue in full vigour throughout the winter, and until those of the ensuing year make their appearance: they are fertile only.

The form of the frond is elongate, linear, and quite undivided, acute at the apex, and cordate at the base. The naked portion of the rachis varies from a tenth to about a third of the entire length of the frond; it is of a dark purple colour, and rather scaly at the base: in some specimens, but these are generally young, the entire plant is hirsute, in others perfectly glabrous. The seedling plants put on a variety of forms; a few of them are shewn at the top of the cut in the margin. The frond is liable to two rather remarkable variations: the first of these is, when the margin is very much longer than the rachis, and is compelled to assume a wavy or curled form; this is the variety called crispum by Mr. Francis, and is figured at the head of the Introduction of this work: the second is when the end is multifid, but this seems rather a monstrosity than a variety, and has a remarkable ugly and deformed appearance: see the divided termination in the annexed cut.

The veins proceed directly from the rachis, and each has four or five branches: to the outside branches of each vein, or set of veins, is attached an elongate linear mass of thecæ, and this mass is covered by a white membranous indusium of the same form. Owing to this disposition of the thecæ on the outer branch, the masses are invariably in pairs; the two indusia at first touch and appear as one, a day or two later a line appears between them shewing that they are divided; the line gradually becomes more apparent as the thecæ increase in size; at last, the two indusia are pushed back from each other, and finally disappear. The veins and attachment of thecæ are shewn on the *upper* side of the figure at page 82; the indusia and masses on the *lower* side: the earliest stage of the double mass and its indusia is shewn to the right hand, and each successive figure towards the left shews a gradual advance towards maturity. The length of the mass is very inconstant.

Gerard mentions a plant under the name Hemionitis sterilis, "which is a very small and base herb, not above a finger high, having four or five small leaves, and of the same substance and colour, spotted on the back part, and like unto Hart's-Tongue, found in a gravelly lane in the way leading to Oxey Park, near Watford, fifteen miles from London, also on the wall at Hampton Court." This plant must, I think, be referred to the present species.

SCALY HART'S-TONGUE.

CETERACH OFFICINARUM.—Willdenow.
Grammitis Ceterach.—Hooker, Mackay, Francis.
Asplenium Ceterach. — Linneus, Hudson, Lightfoot, Bolton, Berkenhout.
Scolopendrium Ceterach.—Smith, Galpine.

LOCALITIES.

ENGLAND . . Yorkshire; Lancashire, very rare, a few fronds so labelled are in Herbaria; Derbyshire, Dovedale, on rocks; Shropshire, on walls at Ludlow; Worcestershire, the Abbey Church at Malvern; Herefordshire, walls in Hereford and Leominster; Gloucestershire, wall at Tocknells, near Painswick; Monmouthshire, on Ragland Castle and Tintern Abbey; Somersetshire, Bath, Bristol, Wells, Langport, Cheddar; Devonshire and Cornwall, in various localities; Berkshire, at Pusey, near Farringdon; Hampshire, on the walls of the city of Winchester; Sussex; Kent, Tunbridge Wells, Maidstone church, Swanscombe church, Shorn church.

WALES . . . Caernarvonshire, walls and rock near Bagnor, on the Caernarvon road; Glamorganshire, Swansea.

SCOTLAND . . At Dundonald and the Carse of Gowrie, according to Hooker.

IRELAND. . . County Dublin, on Tullow church; county Wicklow, at the seven churches of Glendalough; county Kilkenny, near Kilkenny; county Tipperary, Cashel and Clonmel; county Cork, at Kilworth, Glanworth, Fermoy, Rathcormack, Watergrass Hill, Cork, Bandon, Clonakilty; county Kerry, near Tralee, near Killarney county Limerick, Castle Connel, and Limerick; county Clare, Limerick, and near Ennis; county Galway, Loughrea, Galway, Moycullen, and Oughterard.

THIS little fern is distributed over the south-western counties of England and Ireland; it is of rare occurrence in the midland and northern counties, and in Scotland, as far as my own information goes, it is entirely unknown; but Sir W. J. Hooker

records it, on the authority of Dr. Young, as occurring at Dundonald, near Paisley, and at the Carse of Gowrie, on that of Mr. James Macnab, Curator of the Horticultural Society's Experimental Garden at Edinburgh: in this country it scarcely ever occurs in its natural habitat, the dry fissures of rocks; Dovedale, in Derbyshire, Cheddar, in Somersetshire, and a rock on the road between Caernarvon and Bangor, are the only three instances in which I have positively ascertained that it grows in such situations. It has apparently become naturalized in the mortar of our walls and ancient buildings, where it selects the dry parts, and if the lower portion of the walls be wet, it eschews it altogether.

The roots are short, but possess a remarkable power of penetrating the mortar; they are of a brown colour, and somewhat scaly: the rhizoma is tufted, brown, and scaly: the young fronds make their appearance in May and June, arrive at perfection in August, and continue green throughout the winter; they are always fertile.

A small portion only of the rachis is naked, and is beset more or less thickly with pointed chaffy scales: the form of the frond is linear, elongate, and pinnate or pinnatifid: the pinnæ are attached to the rachis by their entire base, and are sometimes also connected with each other; they are obtuse, rounded, and crenate; the entire under-surface of the frond is covered with brown pointed scales, which have been thought in many respects analogous to the indusium of other ferns.

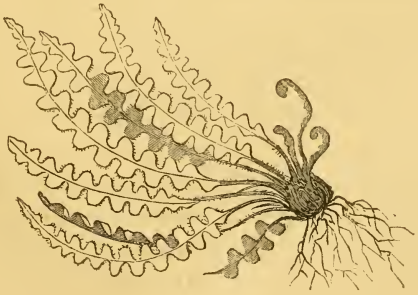
The lateral veins are few in number, alternate, and irregularly branched; they terminate before the margin of the pinna, and are united or anastomose at their extremities, dividing the pinna into a number of compartments. The anterior branch of every lateral vein bears an elongate mass of thecæ, which, unless we consider the scales as analogous to an indusium, are perfectly naked. These thecæ appear to me to be attached to the back of the vein, and to be forced aside by the mode in which they are pressed by the surrounding scales. In many fronds I find a mass of thecæ attached to a lateral vein, which in each pinna runs parallel with the rachis; Mr. Smith, of Kew, considers that, in this mass, the thecæ are so attached as to point towards the rachis, while those of other masses point towards the mid-vein: in examining a great number of specimens I certainly find these have an inclination in the way alluded to by Mr.

Smith, but I consider this to arise from the pressure of the scales, for, in our British Ferns I have observed that when the indusium is entirely absent, the thecæ are not naturally attached to either side of the vein, but to its back. In the pinna from which I have made the drawing shewing the veins, this mass near the rachis did not exist.

I find that Mr. Smith was aware of the anastomosing veins of Ceterach, a very obvious and distinguishing character; but to the best of my belief no author has alluded to it. I observe that Presl places Ceterach in the genus Gymnogramma, in which all the veins are free and unattached at their extremities—indeed he makes this a distinguishing character of the genus. I cannot help thinking that the genera Gymnogramma and Gramınitis are separated on characters really too trivial to notice.

Dioscorides (lib. iii. p. 234) greatly extols the medicinal virtues of this humble fern; he recommends a decoction of it to be taken in wine during the space of forty days; it is not quite a universal panacea, but its powers seem very comprehensive; amongst other qualities he asserts that "*calculos vesicæ comminuit.*" The same author alludes to its similarity to the animal called Scolopendra, a comparison which almost every author institutes, but the resemblance is not very manifest.

The cut below represents a more usual form of Ceterach officinarum than that at p. 85; the difference will be found in the less complete separation of the pinnæ.



BRISTLE FERN.

TRICHOMANES SPECIOSUM.—Willdenow.
Trichomanes brevisetum.—Brown, Smith, Gray, Francis, &c.
Trichomanes pyxidiferum.—Berkenhout, (?) Hudson. (?)
Trichomanes alatum.—Withering.

LOCALITIES.

ENGLAND.
WALES.
SCOTLAND. } Unknown.

IRELAND .. County Wicklow, Hermitage Glen, and Powerscourt Waterfall, in both instances very sparingly: at neither of these localities has more than a single plant been discovered, and fronds of these I have never seen. I report the localities on the authority of Mr. Mackay. County Cork, at Glendine, near Youghal, in luxuriant profusion; county Kerry, at Turk Waterfall, near Turk Lake, Killarney, also in profusion.

THIS is one of the most interesting and most local of our British Ferns. I have introduced two localities recorded by Mackay, but I have never seen a single frond from either of

them; and if the plant still exist in either of these localities, it must be in very small quantities, or it could scarcely have escaped the lynx-eyed botanists from Dublin, who have been almost perpetually hunting for it. I would not recommend a botanist from England to waste a single hour in seeking this fern in the county Wicklow. The locality at Glendine was discovered by Mr. Ball, of Dublin; and he describes the plant as growing here in great luxuriance, a statement in which the fronds in his possession amply bear him out. Mr. Francis, in his "Analysis," states that it was "once found in Ballinhasy Glen, near Cork, by Mr. J. Drummond;" and "near Killarney, in several situations, by Mr. W. Wilson." I could wish the precise localities had been published. I hunted the waterfalls all round Killarney with great diligence, particularly those of O'Sullivan and Derrycunehy, but without any success, and it was only at the often recorded habitat of Turk that I found the slightest trace of Trichomanes. I here found it to the left of the seat whence tourists take the first view of the fall. About fifteen yards higher up the stream, the rocky bank on the left projects into the river; this projection is only to be approached by leaping from stone to stone along the bed of the torrent, which, in times of flood, as happened to be the case when I paid it this visit, is rather an exciting and ticklish operation: you are so close to the fall as to be covered by the spray, and the roar is almost deafening. Having reached the projection, the botanist must ascend it by means of the roots and branches, a feat very readily performed; and there is a little platform at the top, where he can stand very comfortably; and while so standing, he will find the rocky bank just on a level with his eyes completely clothed with Trichomanes, the dark green fronds hanging heavily down, dripping with wet, and, if the sun happen to shine, begemmed with sparkling drops: it is a beautiful sight, and well worth the wet stockings, which, when the flood is on, form a necessary accompaniment of the expedition. The scenery around is well worthy of the rare fern which it cherishes in its bosom.

The roots of Trichomanes speciosum, as well as the rhizoma, a good deal resemble in habit those of Polypodium vulgare; the rhizoma is black, velvety, tough, and remarkably long; some which I pulled out must have been many yards in length: it formed a kind of net work on the perpendicular surface of a

rock, in which its roots had no kind of hold; this was the character of the plant when most luxuriant, but I found other and much smaller plants which possessed more root and less rhizoma, and the roots were fixed in a thin layer of moist earth, among a profusion of moss and Hymenophyllum.

The fronds make their appearance in summer; as late as the beginning of August I found many fronds in the young state, shewn to the left of the illustration, by which it will be seen that the pinnæ are individually circinate, as well as the entire frond. It must be at least as late as October before the fronds arrive at maturity; and I found those of the previous year, very dark coloured indeed, but quite unfaded at the time of my visit.

The form of the frond is triangular, the apex being elongated and pointed; it is pinnate, the pinnæ being also pinnate, and the pinnulæ pinnate: perhaps it would be more correct to describe the hard wiry stem-like veins as thus divided, and to say that each of these veins is furnished on each side with a semimembranous wing, extending throughout its length, for this is the case. The entire frond is composed of these wings, and all its divisions are consequently narrow and linear; the wing is without visible veins of any kind. The figure represents the plant of less than the natural size.

This genus comprises many very beautiful exotic species, principally inhabitants of tropical climates: in some of the West India Islands they clothe the trunks of trees with a most graceful and elegant drapery. The mode of fructification in T. speciosum is very singular. The mass of thecæ is attached to the centre of a vein, after its ultimate division, and invariably to that one which is situated nearest the midvein of the frond, pinna or pinnula, as the case may be. At the attachment of this mass of thecæ the wing loses its green and semimembranous appearance; its cuticles separate, and form an elongate cup-shaped receptacle, which includes the mass of thecæ. The vein itself, after bearing the thecæ, runs through the receptacle, and projects considerably beyond its extremity, in the similitude of a bristle.

This definition of the generic characters appears to me the correct one, but I subjoin that given by Sir J. E. Smith, not simply on account of its remarkable discrepancy with my own view of the structure, but because it is the one usually received.

" Masses of thecæ, roundish, terminal, imbedded in the margin or segments of the frond. Indusium urn-shaped, of the texture of the frond, and continuous with it, of one leaf, dilated upwards, and opening outwards, permanent. Thecæ several, sessile, crowded at the base of a permanent, cylindrical, common receptacle, whose capillary naked point projects beyond the cover, each roundish, of two valves, bound by a vertical jointed ring."—*Eng. Flora*, Vol. iv. p. 324.

Speaking of our British species, Smith describes the fructification thus:—" A few of the uppermost segments, terminating each in a solitary, imbedded, oblong, or cylindrical, somewhat urn-shaped cover, continued from the leaf, slightly winged at the sides, a little dilated, not lobed at the orifice. Thecæ, in a round mass, attached to the base of a cylindrical slender receptacle or column, which, in an early state does not project beyond the cover, but afterwards acquires three or four times the length of that part."—*Id. l. c.*

This fern being, as regards Great Britain, so peculiarly Irish, I have ventured to introduce the sketch of a building equally characteristic of that country.

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TUNBRIDGE FILMY FERN.

HYMENOPHYLLUM TUNBRIDGENSE.—Smith, Hooker, Mackay, Gray, Francis.

Trichomanes Tunbridgense.—Linneus, Hudson, Withering, Bolton, Lightfoot.

LOCALITIES.

ENGLAND . . . Kent, Tunbridge Wells, on the high rocks, and in Edridge Park; Sussex, Handcross, and Tilgate Fount.

WALES. SCOTLAND. } Unknown.

IRELAND . . . . County Galway, Drumsna Wood, near Lough Corrib; county Kerry, on rocks and trees in Cromaglaun Mountain, O'Sullivans, Derrycunehy and Turk Cascades, in numerous spots on the road under Turk Mountain, towards Kenmare on the trunks of oak trees, and on rocks; county Cork, at Glengarriff; county Wicklow, at Hermitage Glen, Glendalough, and Powerscourt Waterfall.

IN this country we have two so-called species of the genus Hymenophyllum; and although nearly all our botanists appear to be agreed in considering them distinct, and even though the difference between them be so obvious, and in so important a part of the plant—its fructification,—yet I must acknowldege, that in retaining the two as species, I merely bow to the opinion of abler botanists than myself.

Hymenophyllum Tunbridgense is a native of the southern counties of England. I have seen numberless specimens from Kent and Sussex, and I am told by different botanists of its occurrence in Cornwall, Devonshire, Somersetshire, and Glamorganshire; but as I have seen no specimen from these counties, and am therefore uncertain as to the species, I have refrained from assigning these habitats to either. In the south and west of Ireland, Tunbridgense appears to be very abundant. I have found it clothing the rocks about Killarney in very great beauty and profusion.

The roots are black, wiry, and very slender; the rhizoma long, black, slender, wiry, and creeping. The fronds consist of a branched series of veins, each being clothed with a membranous or filmy wing, as in Trichomanes: the branches or pinnæ are alternate, and each more or less subdivided; the subdivisions or pinnulæ are mostly in pairs: the margin of the wing is crenated, and very minutely spiny: the masses of thecæ are in flat marginal receptacles, situated at the union of the pinnæ with the rachis: in this species these receptacles have a serrated external margin.

WILSON'S FILMY FERN.

HYMENOPHYLLUM WILSONI.—Hooker, Mackay, Francis.

LOCALITIES.

ENGLAND ... Cumberland; Westmoreland, in the lake district, Scaw Fell, Scale-Force waterfall, Lodore waterfall, waterfall above Ambleside, in ravines near the Skrees, on rocks in Wastdale, and near Wastwater, Derwentwater, Buttermere, and Winandermere; Yorkshire, near Halifax, Greenfield, and Saddleworth.

WALES ..... Caernarvonshire, throughout the Snowdon district, Rhaiadr-y-Wenol, Falls of the Lugwy, Capel Curig, Rhaiadr Mawr, near Llanberris, Cwm Idwel, Nant Frangon, &c. &c.; Merionethshire, at Rhaiadr Du, near Maentwrog, and Rhaiadr-y-Mawddach, near Llaneltyd; Brecknockshire, near Brecon.

SCOTLAND ... Abundant in the Highlands; the localities are far too numerous to detail.

IRELAND. ... Counties Antrim, Londonderry, and Donegal; County Galway, at Maam, Roundstone, and near Oughterard; County Kerry, throughout the Killarney district; County Cork, Glengarriff and Youghal; and County Wicklow, at Glendalough, the Hermitage Glen, and Powerscourt Waterfall.

IN this, as in the preceding species, I have omitted those localities which I could not verify by my own observation; the present species is most abundant in Scotland, descends through the northern English, Welsh, and Irish counties, and finally mingles most abundantly with Tunbridgense, in the southern counties of Ireland.

The roots and rhizoma of Wilsoni offer no characters by which I can distinguish them from those of Tunbridgense; the fronds of both are circinate, they make their appearance late in

the summer months, and usually remain green through the winter, turning completely black in the ensuing spring.

The frond consists of alternately-branched veins, clothed with a membranous wing, the margin of the wings being serrated: the wing on the rachis is less apparent in Wilsoni than in Tunbridgense; the pinnæ are always convex above, while those of Tunbridgense are usually flat: Wilsoni has a more erect habit, Tunbridgense more horizontal, and, indeed, somewhat drooping, so that, on the trunk of a tree, the fronds seem to rest one on another like the tiles of a house. The receptacle is very different from that of Tunbridgense; it is elongate, swollen at the base, and its exterior margin perfectly without serratures: when the seed is mature, the receptacle opens at the top, and, splitting down the middle, remains widely gaping.

A comparison of the two illustrations, which are drawn with considerable care, will enable the botanist to form a more correct idea of the difference between them than I am able to convey by any description: they are of the natural size, the detached pinna of each being magnified.

The Vignette represents a singular Holly-tree at Erwood, on the banks of the Wye, between the towns of Hay and Bualt, a district which has hitherto been but little investigated by the botanists, but which appears to me to offer a rich return for a very moderate labour. The river is very rapid, running through the most beautiful woods, and over a bed of huge masses of stone.

THE FLOWERING FERN: in Scotland, French Brachen.

Osmunda regalis of Authors.

LOCALITIES.

England . . . Yorkshire, near Leeds; Cumberland and Westmoreland, Hesket Moss, and throughout the lake district; Lancashire, at Speke, near Liverpool, on the banks of the Mersey, near Warrington, on Chat Moss, on the bog near Newton, on the Manchester and Liverpool line of railway in great abundance; Chester, by the side of the Mersey, in several localities; Shropshire, at West Felton, and by the bank of Ellesmere Lake, very luxuriant; Warwickshire, abundant on Moseley Common, Birmingham, and in several other localities; Derbyshire, localities too numerous to detail; Devonshire, Turfmoor, near Shopwick, and other localities too numerous to detail; Cornwall, Gwithian, St. Ives, Land's-end, Scilly Islands; Sussex, Parham Park, Uckfield Lake near Lewis, Amberley, and in Ashdown forest; Surrey, abundant near Reigate, Broadmoor, at the southern foot of Leith Hill, Sutton Common, Bagshot Heath; Kent, neighbourhood of Tunbridge Wells, Keston Heath, Hayes Common; Essex, in Epping Forest sparingly, only three or four plants have been obtained at Danbury, covering half an acre of ground; Suffolk; Norfolk; Isle of Wight; Isle of Man.

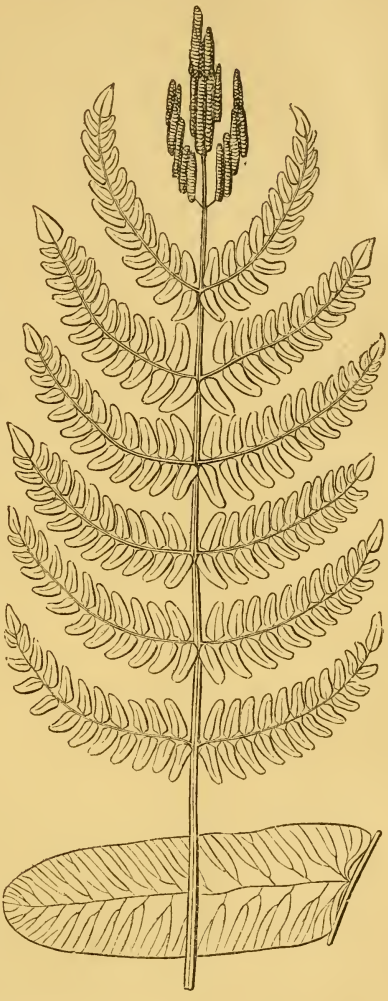
Wales . . . . . Caernarvonshire, near Pont Aberglasslyn; Merionethshire, near Barmouth, near Llaneltyd, near Harlech; Cardiganshire, near Aberystwith, near the Devil's bridge; Glamorganshire, near Swansea, Singleton bog, Cromlyn bog.

Scotland . . . Throughout the Western Highlands of very frequent occurrence, on Lochs Achray, Katrine, Lomond, Long, Fyne, and Awe, very luxuriant; Lanarkshire.

Ireland, . . . County Donegal, on Lough Salt sparingly, on the banks of the river Guibarra, near Docharty bridge in profusion, and of enormous size, near Glenties abundant; County Fermanagh, on the borders of Loughs Erne and Macnean; County Leitrim, near Manorhamilton; County Sligo, near Sligo, and along the road from thence to Ballisodare and Dromore; County Mayo, at the foot of Nephin, and in the neighbourhood of Lough Conn, Coraan Achill, Isle of Achill, Newport, Westport, between Westport and Leenane; County Galway, abundant between Leenane and Clifden, and between Clifden and Roundstone, particularly on the small islands in the lakes, some of which it densely covers, Urrisbeg, Ballinahinch, the Recess, banks of Lake Shindella, Oughterard, Galway, Oranmore, Loughrea, Aughrim and Ballinasloe; King's county, at Shannon harbour; County Clare, Kilrush, Kilkee, and along the Atlantic coast, in many places; County Kerry, Tarbert, Listhowel, Tralee, Killarney most abundant, Kenmare; County Cork, Glengarriff, and near Bantry, Skibbereen, Rosscarbery, Cronakilty, Bandon, Cork, Rathcormack, Fermoy, Mitchelstown, Youghal; County Limerick, near Limerick, Castle Connel, Mitchelstown; County Tipperary, Cahir, Clonmel, Carrick-on-Suir; County Waterford, at May Park, near Waterford; Counties Kilkenny and Wexford, on both banks of the Barrow, near Ross; County Wicklow, on Lough Dan.

By a reference to the synoptical table of genera, it will be seen that this, and the remaining species, are separated by

botanists from the true ferns: from these they differ greatly in the mode of fructification, and more nearly approach the genera Equisetum and Lycopodium, which I have altogether omitted. By our modern continental authors, Sadler, Presl, &c., these three genera are not included in their lists of ferns. I have been induced to append them to my little monograph, not with the view of expressing any difference of opinion on the subject, but because the species are interesting and certainly would be regarded as ferns by that numerous class of which I am myself a member, and which is apt to decide more by external appearance than by less observable characters and minute structural differences.



On the banks of Loch Fyne, where its habit is rigid and erect, as in the accompanying figure, I have seen this noble fern reaching the height of eight feet; growing thus, it is beautiful, but I think it is still more so if pendant, a character it assumes when springing from the water's edge. I noticed a beautiful instance of this at Killarney, where it completely fringes the river between the lakes, and certainly forms a most prominent feature in that lovely but neglected portion of Killarney's far-famed scenery. So altered is the usual character of this fern, that its long fronds arch gracefully over, and dip their masses of seed in the crystal water, while the saucy Coots, from beneath the canopy it affords them, gaze fearlessly on the visitors who are

continually passing by. One of the boatmen employed by Sir Walter Scott, on the occasion of his visit to Killarney, told me that Sir Walter scarcely uttered a syllable in praise of the scenery until he came to this spot; and here he stopped the rowers, and exclaimed, "*This* is worth coming to see!" The boatman evidently thought very meanly of Sir Walter's opinion, whom he considered in duty bound to be in raptures with the lakes and mountains. I do not wonder at the great man's taste: to me it appeared the most wonderfully beautiful spot I had ever beheld, and this beauty is mainly owing to the immense size and number of these pendant fronds.

The long list of localities will shew how widely this fern is distributed over the kingdom: its "metropolis," to borrow an expression from our most celebrated entomologist, appears to be the west of Ireland, more particularly Cunnemara, where it not unfrequently covers the smaller islands in the lakes with a dense mass of its luxuriant fronds; those in the centre being more erect, those round the margin more pendulous.

The roots are strong and fibrous: the rhizoma is tufted, and very large, as might be anticipated from its capacity of annually producing such a weight of foliage: the young fronds, varying in number from six to twelve, make their appearance in May, arrive at maturity in August, and are destroyed by the first frosts of winter; their growth is remarkably rapid and vigorous, and until nearly full grown, they have a reddish colour, like the shoots of many herbaceous plants. The fronds are fertile and barren.

The fertile frond is linear and pinnate: the pinnæ are four or five pairs in number, generally opposite, linear, and pinnate; the pinnulæ are linear, generally alternate, stalked and rounded at the apex, with the exception of the apical pinnula, which is more acute. The apex of the frond is composed of a compact cluster of spikes; these spikes correspond to pinnulæ, of which only the midvein, and a slight marginal wing is present, and to each of the lateral veins is attached a nearly spherical mass of thecæ: these spherical masses entirely supersede any leafy portion in pinnæ so converted; frequent instances, however, exhibit the base of a pinnula in a leafy or barren, while the apex is in a fertile state. In an early stage of the frond these spikes appear crowded and pressed together, as represented in the preceding page, but they soon become more lax and

diffuse, and at last entirely lose their rigid compressed appearance.

The barren frond differs in having the leafy portion continued to the very apex, where it terminates much as in the true ferns. The venation in a barren pinnula is shewn at page 97, where it will be seen that the lateral veins branch alternately from the midvein, soon after leaving which, each is forked, and one or both of the branches are usually again divided, and all the branches run in parallel lines to the extreme margin of the pinnula.

Withering observes of this "flower-crowned prince of English Ferns," that it is available for rockwork, especially if moved with a portion of bog-earth, and can scarcely fail to appear ornamental in any situation. In moving it, great care should be taken to avoid cutting with the spade its enormous rhizoma, an injury which it may perhaps survive, but which so weakens the plant that it will not for years recover its pristine vigour. This rhizoma, when cut through, has a whitish centre or core, called by old Gerard, in his Herbal, "the heart of Osmund the waterman." Withering deduces the name Osmunda from the Saxon word *mund*, signifying strength, in allusion to the supposed invigorating virtues of this fern.

MOONWORT.

BOTRYCHIUM LUNARIA.—Smith, Hooker.
Osmunda lunaria.—Linneus.

LOCALITIES.

ENGLAND . . . Northumberland; Cumberland, Giggleswick not uncommon, on heathy pastures between Newby Cross and Daleton sparingly, Flimsby; Yorkshire, Fullwood, near Sheffield very abundant, Settle, near Halifax; Lancashire, Greenfield, near Manchester; Cheshire; Staffordshire, near Cheedle; Shropshire; Nottinghamshire, near Papplewick; Worcestershire, in an old pasture on Oversley Hill, about a mile from Alcester; Somersetshire, near Bath, near Bristol, Kingsweston Hill; Hampshire, at Harting Combe; Surrey, Coulsden Common, Reigate Park, Shirley Common, near Croydon; Sussex, Boxgrove Common, near Chichester, on the ascent from Patcham, near Brighton, towards Hollingbury Castle; Kent, near Dartford, Scadbury Park; Cambridgeshire, near Linton.

WALES . . . . . Caernarvonshire.

SCOTLAND. . . Dumfriesshire, Clova Mountains and Pentland Hills; Nairnshire, near Auldean; Perthshire, Blair Athol.

IRELAND. . . . County Londonderry, Benyvena Mountains near Magelligan; County Antrim, Black Mountain, near Belfast.

THIS little plant, although widely distributed over the kingdom, can by no means be considered abundant; but it may be said of this and the following species, that from their diminutive size they frequently escape that notice which Osmunda, with its conspicuous appearance, can by no possibility elude.

The Moonwort appears to have been found more frequently in England than in either Wales, Scotland, or Ireland.

The roots and rhizoma of Botrychium and Ophioglossum differ very materially from those of true ferns. The latter appears little more than a subterraneous portion of the rachis, and no observation of my own tends to elucidate its characters. Before the plant has felt the influence of spring it exists in a quiescent state, and consists of a simple stem scarcely an inch in length, and placed vertically in the earth; it is somewhat attenuated at the inferior extremity, and its superior extremity has a whitish bud-like termination, which is the embryo frond of the coming season; I suppose it to be analogous to the rhizoma. In Botrychium, the lower part of the rhizoma bears two distinct whorls of thick yellowish succulent roots, and the upper portion is encased in scale-like alternate sheaths: the specimen from which the figure was drawn was dried and pressed, and was very imperfect in those parts, of which, when drawing it, I was not aware. When the young frond begins to shoot, the operation is shewn by the elongation of the rhizoma: it rises from the ground with a straight, erect vernation in April or May, and the rachis and rhizoma, when the scales have been removed, appear perfectly continuous and identical. It would be highly interesting to ascertain where the bud for the frond of the ensuing year has its origin; and on this subject, I trust, ere long, to inform myself. I can but observe with regret, how little attention botanists pay to precision of terms in the nomenclature of these parts; it is impossible to tell, without reading the character, and not always then, what a botanist means by the word "root;" if he write "root creeping," it is safe to conclude he intends to describe the stem, or rhizoma; if he write "root fibrous," it is safe to infer he means the real root; if he write "root tufted," we may infer that he confuses rhizoma and root together, or that he has no definite meaning, and probably has never seen the part.

The frond (I believe it is always a single one) makes its appearance in April, with an erect, straight vernation, and fades before the winter; it is fertile, except in seedling plants: the usual size is somewhat larger than the specimen figured, and it occasionally reaches the height of six inches.

The rachis is hollow, succulent, and rises from the sheath-like scales already spoken of, thus totally differing from that of the true ferns. It is divided at about half its length: one branch

bearing the leafy portion of the frond, the other its fructification: the leafy portion is pinnate, the pinnæ vary in number from three to eight pairs; they are somewhat fan-shaped, with the exterior margin slightly crenate; the veins in these pinnæ are branched irregularly, and extend almost to the margin, but are never united at their extremities: the fruitful branch of the rachis is pinnate, the pinnæ generally somewhat corresponding in number with those of the leafy frond: these lateral branches, or pinnæ, are frequently again divided, and bear a number of nearly globular thecæ, which, having attained maturity, open transversely, and gaping wide, allow the seeds to fall out.

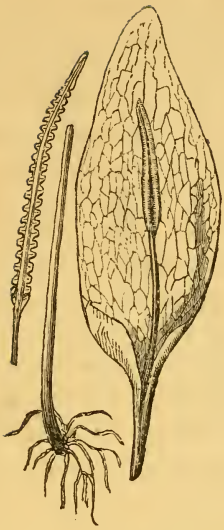
I have seen many singular varieties of this plant: in some of these, one, two, or three of the barren pinnæ have been converted into fertile ones. Three varieties are thus noticed in the English Flora. "β has a branched stalk, bearing several leaves, and compound spikes alternately disposed; γ is a very slight variety, with more jagged leaflets than ordinary; δ has pinnatifid leaflets, and a more spreading habit. All these varieties, and perhaps others, are found occasionally intermixed here and there with the plant in its common or proper form: but never, as far as I can learn, so numerously distinct, as to have the appearance of a different species."

It is rather amusing than instructive to read the virtues ascribed by Dioscorides, and other ancient writers, to nearly the whole family of ferns. Of the present species much has been written, and the most wonderful magical properties have been assigned to it. This we may trace, in a great measure, to the singular form of the pinnæ; all those plants whose leaves bore even a fancied resemblance to the moon—and the name clearly implies that this was the case in the present instance—were formerly regarded with a most superstitious veneration. From all record we find that they were to be gathered by the light of the full moon, or half their powers would be lost. In the present day such fancies are entirely confined to works of the imagination.

> Then rapidly, with foot as light
> As the young musk roes, out she flew,
> To cull each shining leaf that grew
> *Beneath the moonlight's hallowing beams.*

Again—

> And the *white moon-flower*, as it shows
> On Serendib's high crags, &c.



ADDER'S-TONGUE.

Ophioglossum vulgatum of Authors.

LOCALITIES.

England.... Cumberland, near the village of Staunton; Westmoreland, on Lowther Terrace; Yorkshire, near Richmond; Lancashire, near Warrington; Cheshire, near Alderley; Shropshire, near Westfelton; Nottinghamshire, near Morton; Warwickshire, near Birmingham; Worcestershire, near Malvern; Herefordshire, near Leominster; Gloucestershire, near Painswick; Somersetshire, plentiful near Hanbury, Stichwood, Bristol, Bath, &c.; Wiltshire; Hampshire; Surrey, near Dorking, Reigate, and Nutfield; Sussex; Kent, near Higham, below Gravesend; Middlesex; Hertfordshire; Cambridgeshire, near Maddingley, and in Gamlingay wood.

Wales ..... Denbighshire.

Scotland ... Mull of Galloway.

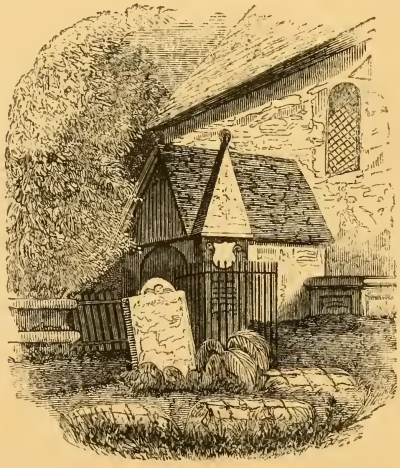
Ireland.... County Londonderry; County Antrim, Black Mountain, near Belfast.

This plant, like the last, is generally distributed over England, and occurs more sparingly in Wales, Scotland, and Ireland; it is, however, far more abundant than the Moonwort, sometimes covering acres of meadow-land, and is considered a serious injury to the crop of grass.

Its roots and rhizoma, if these distinctive names may be still retained, resemble those of the Moonwort: its single frond makes its appearance in May with an erect, straight vernation, sheds its seed in August, and soon after withers and disappears: a few only of the fronds are fertile, nearly nine-tenths being without fructification; its average size is rather larger than represented in the figure.

The fertile frond is composed of a long, smooth, hollow rachis, bearing an ovate, rather acute, slanting, deep green, leafy portion, with a straight, erect, club-shaped spike, issuing from its interior surface at the base: this spike is usually rather longer than the leafy part, and bears the thecæ in a double longitudinal row; when the seed is fully ripe these thecæ open transversely, gape widely, and allow the seed to be scattered by the winds; the figure to the left represents a spike that has shed its seed. The veins in the leafy parts anastomose in every direction.

The Vignette below was drawn in the churchyard at Black Nottley, in Essex. Within the little square of iron railings is the tomb of the illustrious Ray.



CORRIGENDA ET ADDENDA.

At page 17, ALLOSORUS CRISPUS. Add to the English localities, Shropshire, on the Titterstone Clee Hill. The first, second, and third fronds of this species, figured at page 18, are from the same root: the first is the fertile frond, which is produced earliest in the spring; the second, with oak-leaved pinnulæ, is next thrown up, and the third is the production of summer, when the plant is weakened by its previous produce: the fourth frond is a variety.

At page 21, POLYPODIUM VULGARE. The *pinnæ* are in several instances described as *pinnulæ*.

At page 29, WOODSIA ILVENSIS. The second name, W. Hyperborea, should have been printed in italics: as it now stands, it appears that I intended to employ both the names, which was not the case. I should also have added that Woodsia is recorded by Sir W. J. Hooker, on the authority of Mr. James Backhouse, as having occurred in England.

At page 45, LASTRÆA THELYPTERIS. The following localities should be added. ENGLAND.—Norfolk, St. Faith's, Newton bogs; Essex, Little Baddow Common, near Chelmsford; Kent, at North Cray, by the side of a rivulet going down the lane towards the church, and in Waterdown Forest, near Tunbridge Wells; Surrey, below Leith Hill, on a bog near Coal Harbour; Sussex, in Ashdown Forest near Maresfield, Albourne among the alders near the sandpit, bog at Bechley Forge, near Battle, and at Amberley Wildbrook. IRELAND.—County Mayo, on the banks of Lough Carra.

At page 48, LASTRÆA OREOPTERIS. Mr. Pamplin has given me, under the name Thelypteris, a variety of Oreopteris, with the margins of the pinnulæ convolute, and the lateral veins mostly forked; he found it in the marsh through which the road passes between Edridge and Tunbridge Wells: I have found the same variety in Epping Forest.

At page 65, ATHYRIUM FILIX-FEMINA. I have just received a packet from Mr C. C. Babington, containing two beautiful varieties of this fern. 1st. From Trevenna, in Cornwall, with the division of the pinnæ linear or laciniate, with a vein running into each: it is of small size, scarcely four inches in length, and has no seed. 2d. From Stoke Fleming, in Devonshire, with the pinnulæ pinnate, and their divisions toothed.

I shall feel extremely obliged to any of my readers who can send to my publishers' directed for me, living British specimens of Adiantum Capillus Veneris; Polypodium calcareum (of Smith); Woodsia; Polystichum Lonchitis; Lastræa cristata and L. rigida; Trichomanes speciosum or Botrychium lunaria.